PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Is life satisfaction associated with future mental health service use? An observational population-based cohort study
AUTHORS	Michalski, Camilla; Diemert, Lori M.; Hurst, Mack; Goel, Vivek; Rosella, Laura

VERSION 1 – REVIEW

REVIEWER	Khatiwada, Januka International University of Health and Welfare
REVIEW RETURNED	16-Apr-2021

GENERAL COMMENTS	Thank you for providing me with this opportunity to review the manuscript. The study presents an interesting result about association between life satisfaction and future mental health service utilization in inpatients/emergency wards and outpatients facilities in Ontario, Canada. Some points needs more explanation and clarification from introduction to conclusion section. Consistency is required in few places and some table are not very clear. Major revision is required. Following are my feedbacks on the manuscript: 1. The authors have written only lower range of age in both abstract and main body of the manuscript. It would be better also to indicate higher range of age. Please make sure that the person aged above 60 are considered elderly. Can the result become similar between the young adult between 18-59 years and elderly aged 60 and above? 2. In first paragraph of introduction section, the authors have documented some facts about the prevalent of mental illnesses in the world and Canada. However, authors can also summarize the existing researches related to their topic including data about the proportion of people who visit mental health hospitals/clinics. 3. The gap or the statement of the problem is not clearly written. The authors could have written why do they need to conduct this study based on lacking evidence of existing studies in related topics. 4. It is better to explain and synthesize the literature regarding the availability of mental health care facilities available in Canada and how person with mental illnesses access to them. 5. How about the proportion of people who get easy access to mental health care services?

6. Is there any stigmatization associated with seeking for mental health care services?

7. In methods section, in line 34, the authors have cited the detailed methodology elsewhere. As this is an original research, all the required methodologies should be clearly written in manuscript. Please clearly mention the following parts:

A. What was sampling method?
B. How data was collected?
C. Who developed the questionnaire?
D. Was questionnaire validated?

8. In line 34-41 the authors have written about the consent taken from the participants; however, it is not written clearly. For instance, who took informed consent with participants, how consent was obtained (written or oral) If it was oral, why? Was the study approved by any Ethical Review Board? What was the approval number?

9. In measures section, covariates are mentioned but how the authors recoded or broken down the variables are not mentioned. Are the Variables shown in table number 1 recoded by the authors? It is better to write how did they record the variables from original datasets. Age and sex are missing in definition of variables.
10. In the tables, it is also understandable way to present the p-value or indicate with (*) mark in significant value.
11. The authors can move source of data to the bottom of the tables from the title of the tables.
12. Please keep consistency in conclusion. Conclusion should reflect the study aim and major findings in first sentence.

REVIEWER	Dichiara, Ariana Mental Illness Research Education and Clinical Centers at James J Peters VA Medical Center
REVIEW RETURNED	21-Apr-2021

GENERAL COMMENTS	Overall this is a very interesting paper with an enviable n and lots of interesting data. One thing I felt was missing from discussion was the potential for a public health approach to addressing these issues. You recommend diverse community-based resources to address some of the barriers to treatment, which may not be the most efficient way to address the equifinality presented here. Additionally, I think there is room to discuss clinical implications and how a psychologist/psychiatrist may utilize this data to inform treatment.

REVIEWER	Samanta, Guruprasad Indian Institute of Engineering Science and Technology, Mathematics
REVIEW RETURNED	15-Aug-2021

GENERAL COMMENTS	In this work the authors have contributed to a growing body of evidence that highlights the relevance of broader indicators of wellbeing and their influence on health system outcomes. The findings of this study support the incorporation of health indicators that consider socio-ecological perspectives on mental health (and health in general). Socio-ecological perspectives recognize the

influence of broader life contexts and perceptions of wellbeing on our health, underscoring the need for a preventive framework which becomes especially relevant in light of the growing burden of mental illness in Canada.

It may be publishable after citing the following important reference in the text:

1. Dynamics of an Epidemic Model under the Influence of Environmental Stress, Mathematical Biology and Bioinformatics 2021. V. 16. № 2. P. 201–243. doi: 10.17537/2021.16.201

REVIEWER	Rahme, Elham McGill University Health Centre, Division of Clinical Epidemiology
REVIEW RETURNED	25-Aug-2021

| GENERAL COMMENTS | The authors used linked data from several cycles of the Canadian Community Health Survey (CCHS 2005-2014) to the provincial health administrative databases to assess the association between life satisfaction and mental health service use (hospitals/emergency departments, and outpatient visits) in the 5 years following the survey in Ontario, Canada.

The paper is in general very well written except for the Discussion that is weak and mostly irrelevant to the findings of this study. More specifically,

1. Minor-In Abstract-Results the term 'visit history' is not clear
2. The inclusion of all mental disorders together requires some justification and discussion. For example, schizophrenia may cause someone to report dissatisfaction with life and schizophrenia is associated with hospitalizations/ED visits. Therefore, it is difficult to determine if hospitalizations and ED visits were aggravated by dissatisfaction with life or if dissatisfaction with life is part of the sequalae of the disease. The authors could conduct additional analyses to determine the association by the major types of mental health.
3. One outcome is a combination of hospitalizations and ED visits. The authors should report the rate of each separately and combine them only if the numbers are low. They should also report the number of patients with repeated hospitalization/ED visits. Also, the most frequent reasons (principal diagnostic code) for hospitalizations and ED visits will be helpful
4. Bad physical health is associated with both dissatisfaction and mental health and should be adjusted for in the model. If perceived physical health is not available from the surveys, comorbidities such as cancer, cardiovascular events etc could be assessed from the databases
5. The statement 'life satisfaction is an independent risk factor for future mental health visits' and also in the objective :'the impact of life satisfaction on future mental healthcare utilization' suggest causal association and should be reworded as previous mental health is also a risk factor for life dissatisfaction and causal association cannot be inferred. In addition, the authors should adjust for self-perceived mental health (available from the CCHS) which could be different from having had any previous health care encounter for mental health. As the authors state: 'subjective wellbeing measures… are also influential of mental wellbeing and health service use' |
| --- | --- |

6. In Strengths and Limitations, the statement 'Insight into participants' history of mental health visits prior to survey …. limited the potential for reverse causation' is an overstatement, as the authors only adjusted for a dichotomous variable for having had a physician encounter for mental health care. I don't think this adjustment limited the potential for reverse causation as perceived mental health was not adjusted for and some of the results became insignificant when those with prior mental health were excluded. In any case this issue should be given more attention.

7. In Introduction, clarify the meaning of 'burden' (economic, quality of life etc) in 'the burden of mental illness and addictions is estimated to exceed 1.5 times the burden of all cancers'.

8. In Sensitivity analyses 'excluding participants who lost OHIP eligibility for one consecutive year or more'. This should not be a sensitivity analysis. Those who lost OHIP eligibility for any meaningful period of time should be excluded from the main analysis as their data are incomplete.

As said above, most of the discussion is based on speculations and should be revised

9. The statement 'Following adjustment for sociodemographic point estimates were attenuated but still present', should be reworded as 'point estimate is present' is not meaningful.

10. The statement 'findings further support the idea that people who are of lower socioeconomic status experience barriers to long-term and sustained mental health care ….such as in the outpatient setting studied.' requires better justification as those with barrier are less likely to access the health care system for mental health and may have less visits.

11. For the same reasons as above, the following statement may go against the finding of this study 'Indeed, studies have shown that individuals reporting emotional distress and unmet mental health needs are more likely to experience affordability, medication, and trust-related barriers, as well as increased likelihood of not wanting to see a professional.

12. 'Repeated hospital/ED visits point to access challenges and gaps in long-term health care, and cyclically, this further contributes to the overcrowding of EDs observed across Canada'. We do not know from this study how many had repeated ED visits or hospitalizations and if these were related to life satisfaction

13. 'However, shifting the hospital/ED burden strictly to the clinical outpatient setting …There exists a comprehensive need for accessible mental health care, which is only deepening with time. … through improvements to food availability, public transport accessibility, neighbourhood walkability, and opportunities for social and civic engagement, are potential avenues to improve both life satisfaction and mental health.' This whole paragraph seems irrelevant to the design and results of this study and is only based on speculations.

VERSION 1 – AUTHOR RESPONSE

Reviewer 1: Dr. Januka Khatiwada, International University of Health and Welfare
Comments to the Author: Thank you for providing me with this opportunity to review the manuscript. The study presents an interesting result about association between life satisfaction and future mental health service utilization in inpatients/emergency wards and outpatient facilities in Ontario, Canada.

Some points need more explanation and clarification from introduction to conclusion section. Consistency is required in few places and some tables are not very clear. Major revision is required. Following are my feedbacks on the manuscript

1. **The authors have written only lower range of age in both abstract and main body of the manuscript. It would be better also to indicate higher range of age. Please make sure that the person aged above 60 are considered elderly. Can the result become similar between the young adult between 18-59 years and elderly aged 60 and above?**

[Response] Thank you for your helpful suggestion. We only indicated a lower age range because this was a minimum restriction we imposed to focus on adults versus under 18 and did not make a restriction in the upper age; we considered all persons over the age of 18. For your information, the oldest age in our cohort was 102 years old. We agree that life stage is an important factor to consider; however, found that the point estimates for young/middle-aged adults and for older adults were similar. For instance, compared to those reporting being very satisfied/satisfied with life, those reporting being very dissatisfied with life in the overall cohort (including all adults aged 18 and over) exhibited 3.71 (95% CI: 2.14, 6.45) times the rate ratio of hospital/ED visits. Stratifying by age, the same rate ratio for 18- to 59-year-olds was 3.69 (95% CI: 1.98, 6.89) and 3.81 (95% CI: 1.86, 7.83) for those aged 60 years and over. In the outpatient setting, these same comparative rate ratios are 1.83 (95% CI: 1.42, 2.37) for the overall cohort, 1.77 (95% CI: 1.30, 2.41) for 18- to 59-year-olds and 1.65 (95% CI: 1.25, 2.19) for those aged 60 years and over. The similar point estimates and overlapping confidence intervals informed our decision to present the amalgamated results for all adults aged 18 years and over. We have added this as a sensitivity analysis in our manuscript and have included the results in our supplement file. Please find these age-stratified results below for your reference.

Table R1: Rate ratios[a,b] and 95% confidence intervals for counts of (i) hospitalization or emergency department visits, or (ii) outpatient visits for any mental health condition stratified by age group (18-59 years/60 years and over).

Hospital or emergency department visit	18-59 years (N=83,851)	60 years and over (N=47,958)
Very satisfied or satisfied	Ref.	Ref.
Neither	1.96 (1.33, 2.94)	1.31 (0.95, 1.80)
Dissatisfied	2.29 (1.72, 3.04)	2.53 (1.72, 3.72)
Very dissatisfied	3.69 (1.98, 6.89)	3.81 (1.86, 7.83)
Outpatient visit		
Very satisfied or satisfied	Ref.	Ref.
Neither	1.68 (1.45, 1.96)	1.33 (1.08, 1.65)
Dissatisfied	2.26 (1.91, 2.69)	1.44 (1.17, 1.77)
Very dissatisfied	1.77 (1.30, 2.41)	1.65 (1.25, 2.19)

Source: pooled participants of the Canadian Community Health Survey surveyed from 2005 to 2014, linked to the Registered Persons Database, Canadian Institute for Health Information Discharge Abstract Database, the Ontario Mental Health Reporting System, the National Ambulatory Care Reporting System, and the Ontario Health Insurance Plan billings databases.
[a] Multivariable adjusted risk ratios from Poisson regressions (with balanced repeated replication to produce 95% confidence intervals) comparing those who had at least one (i) hospitalization or emergency department visit, or (ii) outpatient visit for any mental health condition, per person-days of follow-up up to 5 years following interview.
[b] Fully adjusted model includes age, sex, survey cycle, immigrant status, household income, having

had any mental health visit in the three years prior to survey interview, smoking status, alcohol consumption, physical activity level, and body mass index.

2.   In first paragraph of introduction section, the authors have documented some facts about the prevalent of mental illnesses in the world and Canada. However, authors can also summarize the existing researches related to their topic including data about the proportion of people who visit mental health hospitals/clinics.

[Response] Thank you for this suggestion, we agree that including this piece in our introduction will appropriately help orient our readers. We have supplemented our introduction and added the following text: *"In a cross-sectional study examining self-reported mental health service use among Ontario residents, service use increased from 7.2% in 2003–2005 to 12.8% in 2011–2014.[1] Among the subgroup reporting a past-year major depressive episode, the proportion of individuals not using mental health services was 48.8% in 2002, and decreased to 35.6% in 2012.[1]"*

3.   The gap or the statement of the problem is not clearly written. The authors could have written why do they need to conduct this study based on lacking evidence of existing studies in related topics.

[Response] We have enhanced our introduction section to better set the stage for the research question. After establishing that the mental health care system is overburdened, we proceed to introduce the concept of positive mental wellbeing and distinguish this from conceptions of mental illness. The relevance of life satisfaction is then presented: given that positive wellbeing extends understandings of health determinants, examining the influence of positive wellbeing on health care utilization can offer additional opportunities for promotional wellbeing-oriented supports. Finally, we review existing evidence regarding the relationship between life satisfaction and a variety of health outcomes, explicitly highlighting the lack of studies examining prospective associations with mental health care utilization. Please see our revised Introduction section for more detail.

4.   It is better to explain and synthesize the literature regarding the availability of mental health care facilities available in Canada and how person with mental illnesses access to them.

[Response] Thank you for this suggestion, we originally discussed mental health care access in Ontario only in our Discussion section. As mentioned, we enhanced our Introduction section and it now includes an overview of the demand and availability of mental health care in Canada. Specifically, we have added the following text: *"Further, the demand for mental health services use is increasing. In Ontario specifically, there are common delays in wait times for counselling and therapy that are often too long for effective care and result in unmet health needs.[2][3]… This increase in demand for health services can effectively strain health system capacity, reducing the quality of services received. A study conducted in south-eastern Ontario found that only 30% of clients seeking community-based care received an intensity of service that matched their psychosocial needs.[4] The majority (80%) of Canadians seek care from their primary care physician, of whom only 23% report feeling prepared for severe mental health problems.[5][6] Evidently, there exists a comprehensive demand for accessible mental health care, which is deepening with time."*

5.   How about the proportion of people who get easy access to mental health care services?

[Response] Unfortunately it is difficult to find a reliable and precise measure of the proportion of people who have easy access to mental health-related services as perceptions of "easy" are subjective and not available in the administrative databases. Our revised Introduction now addresses the proportion of people who experience delays in care, the proportion of people that report poor matching of services, and the proportion of people that seek care from doctors that feel unprepared to offer adequate care for (as described in response to comments #2 and #3). We believe this sufficiently offers our readers a picture of the difficulty experienced in trying to access mental health care services. Relevantly, we also outline the barriers that people experience to accessing health care in our Discussion section as follows, *"Given that emergency health care settings are less porous to affordability-related barriers, this finding points to socioeconomic-related barriers to accessing long-term mental health care. Indeed, studies have shown that affordability issues (as well as medication, stigma, and trust-related barriers) are associated with a higher likelihood of experiencing unmet health needs and lower likelihood of seeking help.[7]"*

6.   Is there any stigmatization associated with seeking for mental health care services?

[Response] Thank you for this interesting question. Yes, indeed there can be stigma associated with seeking mental health care. We are unfortunately unable to measure stigma; however, we do include mention of stigma in the interpretation of our results, specifically when discussing barriers to accessing continued and long-term mental health care (which we have written out in response to comment #5). We agree that stigma warrants mention but because this is not the focus of our study and given we don't have any measures related to stigma, we are unable to extend beyond this point in our discussion.

7.   In methods section, in line 34, the authors have cited the detailed methodology elsewhere. As this is original research, all the required methodologies should be clearly written in manuscript. Please clearly mention the following parts: (A) What was the sampling method? (B) How data was collected? (C) Who developed the questionnaire? (D) Was questionnaire validated?

[Response] Thank you for emphasizing this point. We use data from a national survey that uses an established complex survey design data collection methods that is carried out annually by Statistics Canada. We chose to direct our readers to a detailed paper by Statistics Canada that covers the detailed survey methodology. Nonetheless, we have added some additional detail, which we hope responds to the point raised here. For example, we have included details regarding the consent to link survey responses to administrative data by Statistics Canada to the Methods section such that the CCHS section now reads, *"Developed and administered by Statistics Canada, the CCHS is a cross-sectional survey that uses a multi-stage sample allocation strategy to gather data concerning health determinants, use, and outcomes across Canada. Response rates range from 66% to 79%, and the sample is representative of 98% of the Canadian population aged 12 years or older living in private dwellings. Statistics Canada asks all CCHS participants if they consented to share their survey responses with provincial ministries of health and linking responses to administrative databases. Detailed survey methodology is available elsewhere.[8]"*

For your own interest, we have provided more detail addressing your specific questions below[9]:
(A) Sampling method: Since 2007, data for the Canadian Community Health Survey (CCHS) are collected yearly instead of every two years. While a sample of approximately 130,000 respondents were interviewed during the reference periods of 2001, 2003 and 2005, the sample size was changed to 65,000 respondents each year starting in 2007. A multi-stage sample allocation strategy is used to give relatively equal importance to health regions and provinces. Three sampling frames are used to generate survey participants: (1) *Area frame*: a complex two stage stratified design in which each stratum is formed of clusters; clusters are first selected using a sampling method with a probability proportional to size (PPS), and then the final sample is chosen using a systematic sampling of dwellings in the cluster. The CCHS uses these clusters, then stratifies them by health region, and a sample of clusters and dwellings are then selected within each health region; (2) *List frame of telephone numbers*: an external administrative frame of telephone numbers updated every six months; and (3) *Random digit dialing*: only four health regions use this method (about 1% of the sample is generated this way). Once the dwelling or telephone number sample has been chosen, the next step is to select a member in each household. This decision is made at the time of contact for data collection. All members of the household are listed and a person aged 12 years or over is automatically selected using various selection probabilities based on age and household composition.

(B) Data collection: Data collection for the CCHS is done over the telephone or in person, by either computer assisted personal or computer assisted telephone interviewing techniques. The interview lasts approximately 45 minutes.

(C) Questionnaire development and validation: Each component of the CCHS questionnaire is developed in collaboration with specialists from Statistics Canada, other federal and provincial departments and/or academic fields. Expert Groups were convened to advise on the measures to obtain the results envisioned by the Steering Committee and Advisory Board, and to recommend proven collection vehicles and indices

New modules and revisions to existing CCHS content are tested using different methods. Qualitative tests using individual cognitive interviews or, more rarely, focus groups are used to ensure that questions and concepts are appropriately worded. Field testing can also be conducted to test new modules or significant revisions of the collection instrument. The resulting data are recognized as

valid measures of contemporary concepts such as: depression, activity limitation, weight problems and chronic pain.[9]

Regarding our focal exposure, life satisfaction has been shown to be reliable and valid, to stay moderately stable over time, and to capture information very similarly to multidimensional measures (see Measures section under Methods).[10-13]

8.   In line 34-41 the authors have written about the consent taken from the participants; however, it is not written clearly. For instance, who took informed consent with participants, how consent was obtained (written or oral) If it was oral, why? Was the study approved by any Ethical Review Board? What was the approval number?

[Response] Thank you for your inquiry. All participation in the survey is voluntary, and because the majority of data collection takes place over the telephone, consent is necessarily oral rather than written. The lines you indicated refer to the consent process for survey participants to share their responses with provincial ministries of health and link responses to administrative databases. Specifically, participants are verbally asked the following by trained staff: *"Statistics Canada would like your permission to link information collected during this interview. This includes linking your survey information to your past and continuing use of health services such as visits to hospitals, clinics and doctor's offices. This linked information will be kept confidential and used only for statistical purposes. Do we have your permission?"* to which respondents then verbally answer yes or no. From our starting sample of 213,687 survey participants, 78.4% consented to and were successfully linked to the administrative database. As mentioned in response to comment #7, we have added a detail that Statistics Canada asks for this consent.

Secondly, our study was in fact approved by the University of Toronto's Health Sciences Research Ethics Board (protocol #39444), thank you for bringing this to our attention. We have added the ethics review board approval number under the Methods section.

9.   In measures section, covariates are mentioned but how the authors recoded or broken down the variables are not mentioned. Are the Variables shown in table number 1 recoded by the authors? It is better to write how did they record the variables from original datasets. Age and sex are missing in definition of variables.

[Response] We agree that added detail on all covariates would be helpful for readers and thus have compiled a table containing a more detailed description of each covariate and its construction to our supplementary file (and this table is referenced in the main body of the manuscript under the Methods section). When describing covariates, we have also added that age and sex were collected from the Registered Persons Database. For your quick reference, we have embedded the corresponding supplementary table below:

Table R2: Detailed breakdown of CCHS-derived covariate categorizations used in regression models.

Focal Exposure	Source and classification details
Life satisfaction	**Source:** CCHS **Question:** Using a scale of 0 to 10, where 0 means "Very dissatisfied" and 10 means "Very satisfied", how do you feel about your life as a whole right now? (Response options: *0-10)* **Analytic classification:** *(1) Very satisfied/satisfied (6,7,8/9,10)*

	(2) Neither (5) *(3) Dissatisfied (2,3,4)* *(4) Very dissatisfied (0,1)*
Covariates	
Age	**Source:** Registered Persons Database (contains information on persons registered under the Ontario Health Insurance Plan (OHIP)) **Analytic classification:** *continuous, 18 and over*
Sex	**Source:** Registered Persons Database **Analytic classification:** *(1) Male* *(2) Female*
Immigrant status	**Source:** CCHS **Question:** Were you born a Canadian citizen? (Response options: Yes/No) **Analytic classification:** *(1) Immigrant (No)* *(2) Canadian-born (Yes)*
Household income	**Source:** CCHS **Question:** Thinking about the total income for all household members, from which of the following sources did your household receive any income in the past 12 months? **Analytic classification:** Income deciles are determined by Statistics Canada, which are grouped by the distribution of an adjusted ratio of their total reported household income to the low income cut-off corresponding to their household and community size. It provides, for each respondent, a relative measure of their household income to the household incomes of all other respondent. We collapsed 10 categories into 5. *(1) Lowest income quintile (quintile 1, 2)* *(2) Quintile 3, 4* *(3) Quintile 5, 6* *(4) Quintile 7, 8* *(5) Highest income quintile (quintile 9, 10).*
Smoking status	**Source:** CCHS **Question:** Several variables examining the number of cigarettes smoked per day currently and formerly, a binary measure of having ever smoked 100 or more cigarettes **Analytic classification:** *(1) Current smoker*: smokes daily (smoked at least 100 lifetime cigarettes) *(2) Former smoker:* smoked regularly or occasionally in the past and no longer does (including smoked at least 100 lifetime cigarettes) *(3) Never smoker*: has indicated no current or former smoking habits, or has smoked less than 100 lifetime cigarettes
Alcohol consumption	**Source:** CCHS **Question:** Several variables examining frequency and amount of alcohol consumption **Analytic classification:** *(1) Regular and binge drinker*: has consumed alcohol in the past year with a frequency ranging from once a month to daily, and has engaged in binge

	drinking (defined as 4 drinks for females and 5 drinks for males in one sitting) at any frequency
	(2) Regular drinker: has consumed alcohol in the past year with a frequency ranging from once a month to daily, and has never engaged in binge drinking
	(3) Occasional: has consumed alcohol in the past year with a frequency of less than once per month
	(4) Non-drinker: no alcohol consumption in the past year
Physical activity level	**Source:** CCHS **Question:** This variable is based on the participants' leisure time total daily Energy Expenditure values (kcal/kg/day). *Energy Expenditure for each activity = (N X D X MET value) / 365* N=number of times a respondent engaged in an activity over a 12 month period D= average duration in hours of the activity MET value=the energy cost of the activity expressed as kilocalories expended per kilogram of body weight per hour of activity (kcal/kg per hour)/365 (to convert yearly data into daily data); the low-intensity MET value was used for calculations. **Analytic classification:** *(1) Active* (EE ≥ 3) *(2) Moderately active* (1.5 ≤ EE < 3) *(3) Inactive* (0 ≤ EE < 1.5)
Body mass index (BMI)	**Source:** CCHS **Question:** Self-reported height and weight **Analytic classification:** International standard of BMI classification (kg/m^2) for adults aged 18 and over *(1) Underweight* (<18.5) *(2) Normal (*18.5-24.9) *(3) Overweight* (25-29.9) *(4) Moderately obese* (30-34.9) *(5) Very obese* (≥35)

10. In the tables, it is also understandable way to present the p-value or indicate with (*) mark in significant value.

[Response] We have deliberately chosen not to rigidly interpret analytic results based on whether a given p-value threshold is met given that any chosen threshold is arbitrary. Using p-values as the primary standard of judgment in results interpretation can result in information loss, which is why we were careful not to emphasize the gain or loss of statistical significance in our tables. The following article provides a detailed description of this issue:

Dahiru T. (2008). P - value, a true test of statistical significance? A cautionary note. *Annals of Ibadan postgraduate medicine*, *6*(1), 21–26. https://doi.org/10.4314/aipm.v6i1.64038

11. The authors can move source of data to the bottom of the tables from the title of the tables.

[Response] Thank you for this suggestion, we agree that it can be moved out of the tables. The source is now written in the table footnotes as follows, *"Source: pooled participants of the Canadian Community Health Survey surveyed from 2005 to 2014, linked to the Registered Persons Database, Canadian Institute for Health Information Discharge Abstract Database, the Ontario Mental Health Reporting System, the National Ambulatory Care Reporting System, and the Ontario Health Insurance Plan billings databases."*

12.   Please keep consistency in conclusion. Conclusion should reflect the study aim and major findings in first sentence.

[Response] Our conclusion has been rewritten to highlight the implications of positive mental wellbeing for health care service use, and now more relevantly and clearly reflects on the contributions of our study with respect to these implications. Rather than making reference to the socio-ecological model, the conclusion now more succinctly reads, *"Conceptualizing positive mental wellbeing and health deficits on a dual continuum, our study contributes to a growing body of evidence that connects positive wellbeing with meaningful health system outcomes. The findings of this study emphasize the value in identifying positive wellbeing factors associated with subsequent mental health-related service use, strengthening an evidence base that supports the development of innovative and sustainable mental health interventions."*

Reviewer: 2: Dr. Ariana Dichiara, Mental Illness Research Education and Clinical Centers at James J Peters VA Medical Center
Comments to the Author:
Overall this is a very interesting paper with an enviable n and lots of interesting data.

1.   One thing I felt was missing from Discussion was the potential for a public health approach to addressing these issues. You recommend diverse community-based resources to address some of the barriers to treatment, which may not be the most efficient way to address the equifinality presented here.

2.   Additionally, I think there is room to discuss clinical implications and how a psychologist/psychiatrist may utilize this data to inform treatment.

 [Response] Thank you for your comments. We have revised both the Introduction and Discussion sections and we believe the manuscript is now more explicit in its framing of the importance of positive wellbeing in the context of population health and health system outcomes. More specifically, we discuss the dual continuum model of mental health, which hypothesizes that that gains in mental wellbeing decrease the risk for future mental illness and health deficits. Placed in the context of Ontario's growing demand for mental health care (which is mirrored in many jurisdictions around the world), we highlight the health and public health system implications of examining factors associated with positive mental wellbeing that reduce health care.

We also added a brief overview of two meta-analyses examining the efficacy of positive psychology interventions, which speaks to how mental health care specialists can contextualize and apply the study findings. The protocol and efficacy of applying these interventions at the population level for public health system outcomes does require further study thus we were intentionally careful not to overstate the recommendations that can be made from this study. However, we do believe our findings to be provocative and contribute to innovative developments and interventions for the prevention of mental health issues in the population.

Reviewer: 3: Dr. Guruprasad Samanta, Indian Institute of Engineering Science and Technology
Comments to the Author:
In this work the authors have contributed to a growing body of evidence that highlights the relevance of broader indicators of wellbeing and their influence on health system outcomes. The findings of this study support the incorporation of health indicators that consider socio-ecological perspectives on mental health (and health in general). Socio-ecological perspectives recognize the influence of broader life contexts and perceptions of wellbeing on our health, underscoring the need for a preventive framework
which becomes especially relevant in light of the growing burden of mental illness in Canada.

It may be publishable after citing the following important reference in the text:

1.   Dynamics of an Epidemic Model under the Influence of Environmental Stress, Mathematical Biology and Bioinformatics 2021. V. 16. № 2. P. 201–243. doi: 10.17537/2021.16.201

[Response] Thank you for this recommendation. The referenced article considers a compartmental epidemiological model with infectious diseases to observe the influence of environmental pollution (specifically environmental stress) on infectious disease transmission. While interesting, we found that it bore little relevance to our research question concerning life satisfaction and mental health-related service use.

Reviewer: 4: Dr. Elham Rahme, McGill University Health Centre
Comments to the Author:
The authors used linked data from several cycles of the Canadian Community Health Survey (CCHS 2005-2014) to the provincial health administrative databases to assess the association between life satisfaction and mental health service use (hospitals/emergency departments, and outpatient visits) in the 5 years following the survey in Ontario, Canada. The paper is in general very well written except for the Discussion that is weak and mostly irrelevant to the findings of this study. More specifically,

1.   Minor-In Abstract-Results the term 'visit history' is not clear

[Response] Thank you, we have adjusted this to read, *"history of mental health-related visits."*

2.   The inclusion of all mental disorders together requires some justification and Discussion. For example, schizophrenia may cause someone to report dissatisfaction with life and schizophrenia is associated with hospitalizations/ED visits. Therefore, it is difficult to determine if hospitalizations and ED visits were aggravated by dissatisfaction with life or if dissatisfaction with life is part of the sequalae of the disease. The authors could conduct additional analyses to determine the association by the major types of mental health.

[Response] Thank you for your comment. The reason we did not parse out specific mental health conditions is due to the nature of our outcome, which uses health administrative data to measure mental health-related visits. Notably, our outcome is not solely a function of illness but also a function of administrative procedures and care access. Billing codes for conditions are not validated for any specific mental health conditions other than schizophrenia, which is why we chose not to distinguish between different types of mental health conditions.[14][15] This justification is presented when discussing limitations in the Discussion section.

Per your request, we did conduct an analysis examining only schizophrenia-related visits, and then a second examination of all other non-schizophrenia-related visits, which we have included below (Table R3). The schizophrenia-specific and schizophrenia-excluded results generally reflect the overall findings, which show increased rate ratios per lower level of life satisfaction; additionally, confidence intervals between the two sets of results largely overlap. For schizophrenia-related visits, the largest difference is that in the hospital/ED setting, the estimate for those most dissatisfied became statistically insignificant. However, the point estimate continues to exceed 1. We note that the small proportion of schizophrenia-related visits has resulted in considerable uncertainty around the point estimates.

Table R3: Rate ratios[a,b] and 95% confidence intervals for counts of (i) hospitalization or emergency department visits, or (ii) outpatient visits for any mental health condition, schizophrenia-related conditions, and all conditions excluding schizophrenia.

Hospital or emergency department visit	Schizophrenia (N=131,809)	All but schizophrenia (N=129,914)
Very satisfied or satisfied	Ref.	Ref.

Neither	2.15 (1.21,3.83)	1.56 (1.13, 2.13)
Dissatisfied	3.37 (1.33, 8.54)	2.46 (1.95, 3.09)
Very dissatisfied	1.51 (0.60, 3.76)	4.92 (2.44, 9.90)
Outpatient visit		
Very satisfied or satisfied	Ref.	Ref.
Neither	1.88 (1.12, 3.15)	1.58 (1.37, 1.83)
Dissatisfied	1.56 (0.85, 2.86)	2.17 (1.84, 2.55)
Very dissatisfied	3.04 (1.25, 7.39)	1.64 (1.27, 2.12)

Source: pooled participants of the Canadian Community Health Survey surveyed from 2005 to 2014, linked to the Registered Persons Database, Canadian Institute for Health Information Discharge Abstract Database, the Ontario Mental Health Reporting System, the National Ambulatory Care Reporting System, and the Ontario Health Insurance Plan billings databases.
[a] Multivariable adjusted risk ratios from Poisson regressions (with balanced repeated replication to produce 95% confidence intervals) comparing those who had at least one (i) hospitalization or emergency department visit, or (ii) outpatient visit for any mental health condition, per person-days of follow-up up to 5 years following interview.
[b] Fully adjusted model includes age, sex, survey cycle, immigrant status, household income, having had any mental health visit in the three years prior to survey interview, smoking status, alcohol consumption, physical activity level, and body mass index.

3**.** **One outcome is a combination of hospitalizations and ED visits. The authors should report the rate of each separately and combine them only if the numbers are low. They should also report the number of patients with repeated hospitalization/ED visits. Also, the most frequent reasons (principal diagnostic code) for hospitalizations and ED visits will be helpful.**

[Response] Thank you for these helpful suggestions. The primary reason we reported hospital and ED visits together is due to small cell counts and the similarity of results. Per your request, we separated the inpatient hospital setting from the ED setting and have included the results below (Table R4). The estimates are similar, and all confidence intervals overlap. Ultimately, the overall finding that poor life satisfaction is associated with higher rate ratios of mental health-related visits stands.

Table R4: Rate ratios[a,b] and 95% confidence intervals for counts of (i) inpatient hospitalization, or (ii) emergency department visits for any mental health condition (N=131,809).

Hospital or emergency department visit	**Hospital visit**	**Emergency department visit**
Very satisfied or satisfied	Ref.	Ref.
Neither	**2.14 (1.34, 3.44)**	**1.90 (1.31, 2.75)**
Dissatisfied	**2.79 (1.75, 4.43)**	**2.30 (1.78, 2.97)**
Very dissatisfied	**2.34 (1.39, 3.95)**	**3.79 (2.06, 6.94)**

[a] Multivariable adjusted risk ratios from Poisson regressions (with balanced repeated replication to produce 95% confidence intervals) comparing those who had at least one (i) hospitalization or emergency department visit, or (ii) outpatient visit for any mental health condition, per person-days of follow-up up to 5 years following interview.

Per your second suggestion, we have also added descriptive results to report the number of patients with repeated visits and average number of visits among those with at least one visit – this is an interesting and relevant descriptive, and we thank you for suggesting it. The corresponding results section now reads, "*Restricting to those that had at least one hospital/ED visit during follow-up (N=5,507), the mean number of hospital/ED visits was 2.0 (95% CI: 1.8, 2.1). Stratifying this group by level of life satisfaction, the most satisfied group exhibited the lowest mean at 1.8 (95% CI: 1.7, 1.9), which increased per lower level of satisfaction to reach a mean of 3.36 (95% CI: 1.9, 4.9) hospital/ED visits among those most dissatisfied. Further restricting to those with repeat hospital/ED visits (i.e., >1 visit) during follow-up (N=1,757), the mean number of visits was 4.0 (95% CI: 3.6, 4.3) and estimates followed the same sequential trend when stratified by life satisfaction.*

Among those that had at least one outpatient visit during follow-up (N=49,450), the mean number of outpatient visits was 7.5 (95% CI: 7.2, 7.8). The most satisfied group had the lowest mean at 6.8 (95% CI: 6.5, 7.1) and the dissatisfied group had the highest mean at 15.1 (95% CI: 12.9, 17.4) visits, followed by the very dissatisfied group at 12.8 (9.5, 16.1) outpatient visits. Further restricting to those with repeat outpatient visits (N=31,311), the mean number of visits was 11.2 (95% CI: 10.8, 11.7). Again, the dissatisfied group had the highest mean number of visits at 19.0 (95% CI: 16.1, 21.9), following the same sequential trend when stratified by life satisfaction."

As we mentioned in response to your comment above, mental health conditions other than schizophrenia are not validated and as such we do not want to report the most common reasons for visits. Please note that we do include a supplementary table outlining the ICD-9 and ICD-10 codes defining our outcome, "any mental health-related visit" within each of the two settings.

4. Bad physical health is associated with both dissatisfaction and mental health and should be adjusted for in the model. If perceived physical health is not available from the surveys, comorbidities such as cancer, cardiovascular events etc could be assessed from the databases

[Response] Thank you for this suggestion. We *a priori* chose not to adjust for self-rated general or mental health at the risk of overadjustment. Per your request, we adjusted for self-rated health and have included the results below (Table R5). The results are maintained though slightly attenuated.

Table R5: Rate ratios[a] and 95% confidence intervals for counts of (i) hospitalization or emergency department visits, or (ii) outpatient visits for any mental health condition stratified by self-rated general and mental health (N=131,809).

Hospital or emergency department visit	Additional self-rated health adjustment[b]	Additional self-rated mental health adjustment[c]
Very satisfied or satisfied	Ref.	Ref.
Neither	1.64 (1.09, 2.48)	1.45 (0.93, 2.24)
Dissatisfied	1.83 (1.40, 2.39)	1.46 (1.10, 1.95)
Very dissatisfied	2.76 (1.60, 4.75)	2.23 (1.28, 3.86)
Outpatient visit		
Very satisfied or satisfied	Ref.	Ref.
Neither	1.41 (1.24, 1.61)	1.16 (1.02, 1.32)

Dissatisfied	1.79 (1.52, 2.11)	1.31 (1.11, 1.55)
Very dissatisfied	1.42 (1.08, 1.85)	1.04 (0.80, 1.34)

Source: pooled participants of the Canadian Community Health Survey surveyed from 2005 to 2014, linked to the Registered Persons Database, Canadian Institute for Health Information Discharge Abstract Database, the Ontario Mental Health Reporting System, the National Ambulatory Care Reporting System, and the Ontario Health Insurance Plan billings databases.

[a] Multivariable adjusted risk ratios from Poisson regressions (with balanced repeated replication to produce 95% confidence intervals) comparing those who had at least one (i) hospitalization or emergency department visit, or (ii) outpatient visit for any mental health condition, per person-days of follow-up up to 5 years following interview.

[b] Fully adjusted model includes self-rated health, age, sex, survey cycle, immigrant status, household income, having had any mental health visit in the three years prior to survey interview, smoking status, alcohol consumption, physical activity level, and body mass index.

[c] Fully adjusted model includes self-rated mental health age, sex, survey cycle, immigrant status, household income, having had any mental health visit in the three years prior to survey interview, smoking status, alcohol consumption, physical activity level, and body mass index.

5. The statement 'life satisfaction is an independent risk factor for future mental health visits' and also in the objective :'the impact of life satisfaction on future mental healthcare utilization' suggest causal association and should be reworded as previous mental health is also a risk factor for life dissatisfaction and causal association cannot be inferred. In addition, the authors should adjust for self-perceived mental health (available from the CCHS) which could be different from having had any previous health care encounter for mental health. As the authors state: 'subjective wellbeing measures… are also influential of mental wellbeing and health service use'

[Response] Thank you for pushing us to be clear in our language. We have removed the term 'independent' such that the statement now reads, *"Life satisfaction is a risk factor for future mental health visits."* The objective was also adjusted as such: *"Objective: To investigate the prospective association between life satisfaction and future mental health service use: (1) hospital/emergency department, and (2) outpatient settings."*

Regarding adjustment for self-rated mental health, the results are included in Table R5 above. This adjustment most drastically reduced the point estimate for the very dissatisfied group in the outpatient setting wherein the rate ratio prior to adjustment for self-rated mental health was 1.83, which dropped to 1.04. The results overall pointed to increased rates of visits with poorer life satisfaction. Remaining cognizant of overadjustment and the fact that the general trends persist (poor life satisfaction continues to be associated with higher rate ratios of visits), we will continue to report the main finding using our original fully adjusted model. However, we do believe this analysis warrants consideration, so we have added the corresponding table to our supplement file, which includes the results of all our *a priori* sensitivity analyses (Supplementary Table 2B). We summarized and reported the results of this analysis as such, *"Taking the original fully adjusted models and additionally adjusting for self-rated mental health, the direction of point estimates remained consistent but were attenuated. Specifically, the rate ratios for those reporting being very dissatisfied became statistically insignificant in the outpatient setting (Supplementary Table 2B)."*

6. **In Strengths and Limitations, the statement 'Insight into participants' history of mental**

health visits prior to survey …. limited the potential for reverse causation' is an overstatement, as the authors only adjusted for a dichotomous variable for having had a physician encounter for mental health care. I don't think this adjustment limited the potential for reverse causation as perceived mental health was not adjusted for and some of the results became insignificant when those with prior mental health were excluded. In any case this issue should be given more attention.

[Response] Thank you for suggesting we more closely examine the wording of this statement. We did not intend to claim that our sensitivity eliminated the potential for reverse causation, only that it was limited to a degree. Our main intention was to highlight how the study data was well-positioned to more robustly test the prospective association in question by taking histories of visits and a wash-out period into account, thus significantly improving upon previous studies. We have altered the wording such that these statements now read, *"… decreased concern for reverse causation"* which we hope is clearer. As mentioned in response to comment #5, we have incorporated a sensitivity analysis adjusting for self-rated mental health and the results are reported in the supplementary file.

7. In Introduction, clarify the meaning of 'burden' (economic, quality of life etc) in 'the burden of mental illness and addictions is estimated to exceed 1.5 times the burden of all cancers'.

[Response] The burden refers to a report wherein health-adjusted life years (HALYs) are examined. We have added this detail, such that the sentence now reads, *"In Canada's most populous province of Ontario, the burden of mental illness and addictions (in terms of health-adjusted life years) is estimated to exceed 1.5 times the burden of all cancers, and seven times the burden of all infectious disease."*

8. In Sensitivity analyses 'excluding participants who lost OHIP eligibility for one consecutive year or more'. This should not be a sensitivity analysis. Those who lost OHIP eligibility for any meaningful period of time should be excluded from the main analysis as their data are incomplete.

[Response] Thank you for this important suggestion, which we took into consideration during the study conception and design. As mentioned, we decided to only exclude participants that lost OHIP eligibility for the full follow-up time and conducted a sensitivity analysis excluding those who lost eligibility for a year or more. This decision was primarily based on the fact that our study sample does not consist of a random sample of the general population using only administrative data, but rather of documented survey respondents living in Ontario at the time that agreed to have their survey data linked to health administrative databases. Fully excluding anyone that lost OHIP eligibility for any amount of time could bias the results in a particular direction when one considers the that Ontarians commonly lose OHIP eligibility and only renew it upon the very next contact with the health care system. Moreover, OHIP eligibility is not updated in real-time, nor precise. For these reasons, we determined that exclusion from the outset was too restrictive and decided to instead conduct a sensitivity analysis. Nonetheless, when this group was excluded, we received very similar results, which are transparently summarized in the main body of the manuscript and fully presented in the supplement file.

As said above, most of the Discussion is based on speculations and should be revised:
9. The statement 'Following adjustment for sociodemographic point estimates were attenuated but still present', should be reworded as 'point estimate is present' is not meaningful.

[Response] Thank you for this revision. We have changed the wording such that the sentence now reads, *"Following adjustment for sociodemographic measures, mental health-related visit history, and health behaviours, point estimates were attenuated but continued to indicate higher rate and risk ratios for lower levels of life satisfaction."*

10. The statement 'findings further support the idea that people who are of lower socioeconomic status experience barriers to long-term and sustained mental health care ….such as in the outpatient setting studied.' requires better justification as those with barrier are less likely to access the health care system for mental health and may have less visits.

11.   For the same reasons as above, the following statement may go against the finding of this study 'Indeed, studies have shown that individuals reporting emotional distress and unmet mental health needs are more likely to experience affordability, medication, and trust-related barriers, as well as increased likelihood of not wanting to see a professional.

[Response] The reasoning provided above, that those with barriers are less likely to access the health care system for mental health resulting in less visits, is precisely the explanation we provided in the manuscript. Referring back to the results from the joint-effects model, examining the point estimates for the most dissatisfied groups, those with the lowest income exhibited the highest rate ratio of hospital and ED visits (settings which are less porous to affordability-related help-seeking barriers), and conversely exhibited the lowest rate ratio of outpatient visits (settings which are more porous to affordability-related help-seeking barriers). In fact in the outpatient setting and among the most dissatisfied groups, it was the highest income group that exhibited the highest rate ratio of outpatient visits. As in your comments above, we reason that high hospital/ED rate ratios and low outpatient rate ratios, as observed in our joint effects model, suggest that lower socioeconomic status poses barriers to long-term and sustained mental health care.

To improve clarity, we reworded this section of our Discussion and explicitly state compared to outpatient care settings, the hospital/ED setting is less porous to variabilities in health behaviours, health literacy, and access gaps. Specifically, this section now reads, "*Our findings also showed that low household income exacerbates the observed associations with life satisfaction. The most dissatisfied low-income group exhibited a substantially higher rate ratio of hospital/ED visits compared to their higher income counterparts. Yet in the outpatient setting, compared to their most dissatisfied counterparts, the low-income group exhibited the lowest rate ratio of mental health-related visits. Given that emergency health care settings are less porous to affordability-related barriers, this finding points to socioeconomic-related barriers to accessing long-term mental health care. Indeed, studies have shown that affordability issues (as well as medication, self-stigma, and trust-related barriers) are associated with a higher likelihood of experiencing unmet health needs and lower likelihood of seeking help.[7] In this way, our joint-effects models demonstrated that improving access to long-term mental health-related care is particularly pertinent for the most dissatisfied and low-income individuals.*"

12.   'Repeated hospital/ED visits point to access challenges and gaps in long-term health care, and cyclically, this further contributes to the overcrowding of EDs observed across Canada'. We do not know from this study how many had repeated ED visits or hospitalizations and if these were related to life satisfaction

[Response] Descriptively, our Table 1 shows a higher mean number of visits in the hospital/ED setting per lower level of life satisfaction. Additionally, in response to your third comment, we have also now added a description of the mean number of visits among those with at least one visit and among those with repeat visits (which we included in response to your comment #3). Nonetheless, in response to overall feedback concerning our Discussion, we reworked this section, and this statement was removed.

13.   'However, shifting the hospital/ED burden strictly to the clinical outpatient setting …There exists a comprehensive need for accessible mental health care, which is only deepening with time. … through improvements to food availability, public transport accessibility, neighbourhood walkability, and opportunities for social and civic engagement, are potential avenues to improve both life satisfaction and mental health.' This whole paragraph seems irrelevant to the design and results of this study and is only based on speculations.

[Response] Thank you for this feedback. As mentioned, we reworked our Discussion and this piece was replaced with a more relevant discussion of positive wellbeing interventions. Please read the revised Discussion for more detail.

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VERSION 2 – REVIEW

REVIEWER	Khatiwada, Januka International University of Health and Welfare
REVIEW RETURNED	13-Dec-2021

GENERAL COMMENTS	All the given comments are appropriately addressed and clearly explained. I would like to request editor to accept the paper and congratulate the authors.

REVIEWER	Rahme, Elham McGill University Health Centre, Division of Clinical Epidemiology
REVIEW RETURNED	07-Oct-2021

GENERAL COMMENTS	No additional comments