3-2021

The effects of income on health: Evidence from lottery wins in Singapore

Seonghoon KIM
Singapore Management University, SEONGHOONKIM@smu.edu.sg

Kanghyock KOH
Korea University - Korea

The effects of income on health: Evidence from lottery wins in Singapore☆

Seonghoon Kim[a1]

Kanghyock Koh[b]

[a] School of Economics, Singapore Management University, Singapore
[b] Department of Economics, Korea University, Seoul, South Korea

Published in Journal of Health Economics, Volume 76, March 2021, 102414
https://doi.org/10.1016/j.jhealeco.2020.102414

Abstract

We estimate the causal effects of household income on self-reported health status by exploiting random variations in the amount of lottery prizes won. We find that a S$10,000 (US$7,245) increase in income via lottery wins improves individuals' health by a standard deviation of 0.18. As possible mechanisms, we find that lottery wins increase household consumption spending and improve overall life satisfaction, but do not change healthcare spending, labor supply, and risky health behavior. Previous studies, which focused on the health effects of lottery prizes in Western European countries with strong social safety nets, do not find positive effects other than those on mental health. By contrast, the current study contributes to the literature by providing new evidence of the positive health effect of income via lottery wins in a country without strong social safety nets.

Keywords: Lottery prize, Health, Unearned income, Singapore

1. Introduction

Estimating the causal relationship between income and health can assist policymakers to better design public cash transfer policies to improve public health. An increase in income allows individuals to afford more healthcare and other goods and services, and enjoy more leisure activities, thus enhancing health (Grossman, 1972). However, it can also induce engagement in risky health behaviors, such as smoking and drinking (Apouey and Clark, 2015; Van Kippersluis and Galama, 2014).

Despite its importance, it is difficult to uncover the causal relationship between income and health due to several empirical issues, including omitted variable bias and reverse causality (Cutler et al., 2012). As such, it is critical to employ a credible research design for causal inferences. The ideal approach to overcome this identification challenge is to randomly assign income to individuals. Such random assignment guarantees that individual characteristics are independent of the assigned income, and thus, on average, treated and control groups have the same observable and unobservable characteristics, except in the assigned income amounts. This research design allows researchers to interpret observed differences in health as the causal effects of income. However, it is often infeasible to implement such an experiment on a large scale due to high costs, especially in developed countries.[2]

☆ The Singapore Life Panel data collection was financially supported bythe Singapore MOE Academic Research Fund Tier 3 grant (MOE2013-T3-1-009). All errors are our own.

*Corresponding author:.E-mail addresses: seonghoonkim@smu.edu.sg (S. Kim), kkoh@korea.ac.kr (K. Koh).

[1] Seonghoon Kim and Kanghyock Koh equally contributed to the study.
[2] Most experimental evidence on cash transfers are based on studies conducted in developing countries (e.g., Baird et al., 2013; Haushofer and Shapiro, 2016). In developed country settings, many studies have examined the effects of public cash transfers. For example, Gross and Tobacman (2014) reveal that an increase in tax rebates in the U.S. leads to an increase in drug- and alcohol-related visits. By contrast, Chung et al. (2016) show that Alaska's annual cash transfer program (the Alaska Permanent Fund Dividend) substantially decreases the incidence of low birth weight. Frijters et al. (2005) find a small positive health effect of an increase in permanent income among Eastern Germans after reunification. Evans and Garthwaite (2014) also document positive health impacts of the Earned Income Tax Credit program for eligible mothers.

As an alternative approach to estimating the causal effects of income, a growing body of research has exploited lottery wins as a source of exogenous variations in income (Lindh and Ohlsson, 1996; Imbens et al., 2001; Lindahl, 2005; Doherty et al., 2006; Hankins and Hoekstra, 2011; Hankins et al., 2011; Kuhn et al., 2011; Apouey and Clark, 2015; Cesarini et al., 2016; Raschke, 2019; Fagereng et al., 2020; Lindqvist et al., 2020; Östling et al., 2020; Briggs et al., 2020). By construction, the possibility of winning a lottery prize and the amount of prizes won are randomly determined, conditional on lottery ticket spending. As such, lottery prize data allow researchers to cleanly identify the causal effects of unanticipated income changes.

We estimate the health effects of unearned income by exploiting random variations in income generated by lottery wins. We use data from the Singapore Life Panel (SLP), a nationally representative survey data of Singaporeans aged 50–70, for the empirical analysis. Singapore provides a useful context to study the effects of lottery wins on health because of Singaporeans' avid playing of the lottery. For example, about 60% of SLP respondents of the SLP plays the lottery. It also recorded the largest spending per capita on lotteries globally in 2013 and 2017 (Markle et al., 2014, 2018).

Our results provide evidence that a S$10,000 (US$7,245 or €6196) increase in unearned income via lottery wins improves household members' self-reported overall health status by 0.15 points (0.18 standard deviation, or SD) or increases the probability of reporting excellent, very good, or good health by 7.3 percentage points (0.15 SD).[3] The estimates are about 30–40% smaller than the income-health gradients, implying that naive OLS estimates of the associations between income and health can overemphasize the importance of income for health. A heterogeneity analysis indicates that the estimated impacts appear to be larger among those with liquidity constraints.

We then examine the effects of lottery wins on comprehensive outcome measures such as healthcare spending, total household consumption spending (except for spending on healthcare and cigarettes), labor supply, psychological well-being, and cigarette spending to investigate possible mechanisms. We find little evidence that lottery wins increase healthcare or cigarette spending or that it discourages labor supply. Instead, we show that lottery wins increase total household consumption spending and improve psychological well-being.

This study contributes to the literature by providing new evidence on the health impact of lottery wins in a different context. Our finding that an increase in household (unearned) income improves older individuals' health status is contrary to previous findings of no health effects from lottery wins (Apouey and Clark, 2015; Cesarini et al., 2016; Raschke, 2019; Östling et al., 2020) except for the results of Lindahl (2005).[4] One suggested explanation is that an additional increase in income may not play a significant role in improving health in Western European countries, such as the UK, Germany, and Sweden, that operate strong social safety nets (Cesarini et al., 2016; Östling et al., 2020). By contrast, health effects could differ in other countries, such as Singapore, that emphasize individual responsibility and offered limited social assistance until recently (Choon, 2010; Haskins, 2011). These differences in the health effects of lottery wins across heterogeneous settings enable a more comprehensive understanding of the role of income in health.

This study also contributes to the literature by examining several potential mechanisms. Exploiting rich information of the survey data, we examine the relationships between lottery wins and medical expenditures, consumption spending, labor supply, subjective well-being, and risky health behavior measured by cigarette smoking. For example, consumption spending information is typically not available in administrative data. Although the previous studies using survey data, such as British Household Panel Survey, the Swedish Level-of-Living Survey, and the German Socio-Economic Panel, could investigate potential mechanisms, these studies could not control for ticket spending (Apouey and Clark, 2015; Lindahl, 2005; Raschke, 2019), which may have resulted in biased estimations, as Cesarini et al. (2016) points out. We overcome this limitation by directly controlling for lottery ticket spending.[5] In addition, we conduct a variety of robustness checks, which may be useful for other studies using lottery prize data.

The rest of this paper is structured as follows. Section 2 describes the data. In Section 3, we present our empirical strategy to identify the causal effect of unearned income via lottery wins on health. Section 4 reports the results, and Section 5 concludes.

2. Data

We use data from the SLP to conduct the empirical analysis. Started in July 2015, the SLP is a monthly longitudinal survey of a nationally representative sample of 50–70-year-old Singaporeans and their spouses. This sampling feature of the SLP resembles that of the U.S. Health and Retirement Study. About 8000 respondents participate in the SLP survey on a monthly basis.

and Shapiro, 2016). In developed country settings, many studies have examined the effects of public cash transfers. For example, Gross and Tobacman (2014) reveal that an increase in tax rebates in the U.S. leads to an increase in drug- and alcohol-related visits. By contrast, Chung et al. (2016) show that Alaska's annual cash transfer program (the Alaska Permanent Fund Dividend) substantially decreases the incidence of low birth weight. Frijters et al. (2005) find a small positive health effect of an increase in permanent income among Eastern Germans after reunification. Evans and Garthwaite (2014) also document positive health impacts of the Earned Income Tax Credit program for eligible mothers.

[3] S$1 was equal to US$0.724 or €0.620 on July 27, 2020.

[4] Gardner and Oswald (2007); Apouey and Clark (2015), and Raschke (2019) document positive impacts of lottery wins on mental health. Van Kippersluis and Galama (2014) document that a lottery win changes winners' health-related behaviors such as smoking and drinking. Cheng et al. (2018) find that lottery winners with larger wins are more likely to use private health services instead of public health services in the UK.

[5] We acknowledge that Cesarini et al. (2016) use administrative data in Sweden that include ticket spending information when estimating the effects of lottery wins on health.

Table 1
Lottery-Related Characteristics.

A. Annual spending on lottery tickets	2,278
5th percentile	19.9
10th percentile	39.8
25th percentile	119
50th percentile	600
75th percentile	2,584
90th percentile	5,200
95th percentile	8,787
B. Pr(lottery prize>0)	50.7%
C. Annual lottery winnings (>0)	1,088
5th percentile	9.9
10th percentile	19.9
25th percentile	50.0
50th percentile	248.5
75th percentile	795
90th percentile	2,500
95th percentile	5,000
D. Ratio of lottery prize over lottery ticket spending	0.60
Observations	6,212

Note: Monetary units are in 2016 Singapore dollars.

In November 2016 and 2017, the SLP asked its respondents about their lottery ticket spending and prize amounts won in the last 12 months. Lottery tickets are mostly sold over the counter. Unlike the US and European countries, Singapore does not sell lottery products that pay out prizes in the form of annual installments.

To construct the treatment and key control variables, we calculate the total amount of lottery prizes won and ticket spending over the last 12 months at the household level. Compared to other survey data used in the literature, such as the British Household Panel Survey, the Swedish Level-of-Living Survey, and the German Socio-Economic Panel, the advantage of the SLP is that it directly collects information on lottery ticket spending. Thus, we are able to exploit random variations in lottery prizes conditional on ticket spending.[6]

Table 1 reports the summary statistics of the lottery-related variables. On average, lottery players spend S$2,278 (US$1,650) per year on lottery tickets with significant heterogeneity in the spending distribution. The 5th-percentile value of annual lottery ticket spending is only about S$20 (US$14.5), while the 95th-percentile value is S$8,787 (US$6,366). The lottery ticket spending as shown in the SLP may seem high, but it is consistent with the fact that Singapore records the largest spending per capita on lotteries globally (Markle et al., 2014, 2018). La Fleur's World Lottery Almanac (Markle et al., 2018) reports Singapore's 2017 per capita lottery sales as US$914 (S$1,269). This statistic is consistent with the average lottery ticket spending amount in the SLP data, considering that about 60% of respondents plays the lottery. Of those who play the lottery, 50.7% report positive lottery prize amounts, with the average annual prize amount being S$1,088 (US$788). The 95th-percentile value of the lottery prize distribution is S$5,000 (US$3,622), while the 5th-percentile value is about S$10 (US$7.2). In our sample, the ratio of the amount of lottery prizes to the amount of lottery ticket spending is 0.6.

Our primary dependent variable is current general health status, which represented self-reported values in the November 2016 and 2017 SLP. Specifically, the SLP asks the following question: "Would you say your health is excellent, very good, good, fair, or poor?" In the baseline analysis, we use this variable by assuming its values as cardinal. Additionally, we construct a binary indicator variable of whether the self-reported health status is excellent, very good, or good. To address the ordinal nature of the original question, we employ an ordered logit regression model for a robustness check. To examine whether changes in self-reported health status are correlated with the incidence of health conditions, we also use binary indicators of the incidence of any major health conditions as diagnosed by a doctor (hypertension, diabetes, cancer, heart problem, stroke, arthritis, and psychiatric problems).

We construct five outcome variables to examine possible mechanisms. First, we calculate the average of monthly total healthcare spending in the last 12 months. We complement this measure of healthcare utilization by constructing measures on detailed healthcare spending, the averages of monthly spending on health insurance premium payments, prescribed medicines, other drugs, as well as inpatient, outpatient, and home nursing care in the last 12 months. Second, winning lottery prizes could change households' consumption spending other than healthcare (Kim and Koh, 2020a). To examine this channel, we calculate the average of total spending, except for spending on healthcare and cigarettes, during the last 12 months. Third, an increase in income can reduce labor supply, and thus improve health status. To measure labor supply, we construct a binary indicator of employment status.[7] Fourth, following existing studies (Deaton, 2002; Apouey and Clark, 2015; Graham, 2008) arguing that psychological well-being can be an important determinant of health, we measure psychological well-being using self-reported overall life satisfaction. Finally, Van Kippersluis and Galama (2014) and Apouey and Clark (2015) reveal that lottery winners change their spending on alcohol and cigarettes, which can weaken the beneficial health effects of winning the lottery. Since the SLP does not provide information on alcohol spending, we construct a variable for the average monthly spending on cigarettes in the last 12 months.

In the regression analysis, we include individual characteristics, such as age, age squared/100, dummy variables (measured prior to the lottery survey waves) indicating gender, secondary education, post-secondary education,

[6] To overcome the lack of data on ticket spending, previous studies using survey datasets such as British Household Panel Survey, the Swedish Level-of-Living Survey, and the German Socio-Economic Panel include individual fixed effects since the employed data survey lottery prizes over a longer period. We acknowledge that the SLP only collects information on lottery prizes and spending twice. Thus, it may not be appropriate to include household fixed effects due to insufficient within-household variation in lottery prize and outcome variables.

[7] The SLP does not ask about specific working hours. Instead, it asks whether a respondent is working 35 hours or more per week, less than 35 hours per week, or if the working hours vary. As a complementary measure for labor supply, we construct a binary indicator of full-time work status, which takes the value of 1 if a respondent works 35 hours or more per week and 0 otherwise.

and ethnicity/race, the number of children, the number of household members, home ownership status, and self-reported risk preference as control variables.[8] To control for households' income status, we include household income, employment status, and the amounts of private transfers. Since these are potential outcomes, to minimize the potential bad-control issue, we control for lagged values (one year prior to lottery participation) of these variables. If these lagged values are missing, we impute the missing information with the values from neighboring months (i.e., values measured either 13 or 11 months ago).

Since there is no variation in the lottery prize amount among households without lottery players, we use only the sample of lottery-playing households. Table 2 shows the summary statistics of health-related outcome variables and control variables between households with and without lottery players. Columns (1) and (2) indicate modest heterogeneity between the two groups of households. Overall, households with lottery players have worse health, spend more on healthcare and cigarette smoking, have lower life-satisfaction, are less educated, and have a greater share of males and ethnic Chinese individuals.[9]

3. Empirical strategy

To estimate the causal effect of unearned income from lottery wins on health, we consider the following linear regression model by pooling data from the November 2016 and 2017 survey waves:

$$HEALTH_i = \beta_0 + \beta_1 PRIZE_i + \beta_2 TICKET_i + X_i^{'}\gamma + \varepsilon_i, \quad (1)$$

where i denotes an individual; $HEALTH_i$ indicates self-reported general health status of individual i; and $PRIZE_i$ and $TICKET_i$ indicate individual i's household-level amounts of lottery prizes and lottery ticket spending in Singapore dollars (divided by S$10,000), respectively, in the last 12 months. Controlling for ticket spending is important because the estimated health effects of lottery wins could be biased to the extent that lottery prizes are correlated with lottery ticket spending. X_i includes the individual and household characteristics of individual i, year dummy, and district fixed effects.[10] Our parameter of interest is β_1, which captures the effects of a S$10,000 increase in the amount of lottery prizes won during the last 12 months on current overall health status. Many respondents in the sample participated in the lottery-related questionnaire both in years 2017 and 2018. Hence, we cluster the standard errors at the household level to adjust for potential correlations of health status within households. We use the same specification when considering other dependent variables.

The key identification assumption to interpret β_1 as a causal parameter is that lottery prizes are randomly determined conditional on lottery ticket spending. To test this assumption, we estimate the relationship between lottery prizes won and lottery ticket spending and covariates. Specifically, we use the following equation:

$$PRIZE_i = \alpha_0 + \alpha_1 TICKET_i + X_i^{'}\gamma + \omega_i, \quad (2)$$

in which we follow the same notations and use the same control variables as in Eq. (1). If a lottery prize is randomly assigned, the coefficients of covariates other than that of lottery ticket spending would be statistically insignificant. To further test whether variations in lottery prizes conditional on ticket spending are randomly determined, we estimate Eq. (1) without including the control variables and examine if the magnitudes of the coefficient estimate of β_1 would be insensitive to the absence of control variables.[11]

Table 3 presents the relationships between lottery prize and ticket spending and other control variables using regression specification (2). The results indicate that lottery prizes conditional on lottery ticket spending have statistically insignificant relationships with individual characteristics except for the year dummy. The statistically significant coefficient estimate of this variable likely reflects the different prize structures of various lottery products in Singapore each year; according to Picchio et al. (2018), this is the case in the Netherlands. The p-value of the F-test of joint significance of all covariates except for the year dummy is 0.146. Even if we include the year dummy, the p-value of the test of joint significance would be 0.103.[12]

4. Empirical results

4.1. Effects of lottery wins on health status

Panel A of Table 4 reports the effects of lottery wins on self-reported health status. Column (1) shows that a S$10,000 increase in the lottery prize won in the last 12 months improves health status by about 0.15 points. This is equivalent to a SD of 0.18 and an approximate 5.5% increase in the mean and is statistically significant at the 1% level. Column (2) indicates that the probability that self-reported health is good, very good, or excellent increases by 7.3 percentage points, equivalent to 0.15 SD and a 12.1% increase in the mean; the coefficient estimate is also statistically significant at the 1% level. The results imply that an increase in unearned income improves individuals' self-reported health. Table A1 reports the full regression results, including the coefficient estimates of all regressors.

[8] A respondent's risk preference is measured by a subjective response to the following question: "Are you generally a person who tries to avoid taking risks or one who is fully prepared to take risks? Please rate yourself from 0 to 10, where 0 means 'not at all willing to take risks' and 10 means 'very willing to take risks'."

[9] The results are robust when including non-players in the sample and matching them to players with the probability of lottery playing based on observable characteristics (i.e., propensity score).

[10] In Singapore, there are 80 postal sectors, denoted by the first two digits of the postal code. We refer to a postal sector as a district in this study.

[11] We do not use the amount of lottery prizes won as an instrument for income because it is unlikely to satisfy the exclusion restriction. That is, lottery wins can affect health via other channels than household income. For example, Cesarini et al. (2017) show that winning the lottery reduces labor supply and earnings. This implies that lottery wins can directly affect health without significant changes in total household income. In addition, winning the lottery can potentially induce "the thrill-of-winning." This can also affect health, aside from the income channel.

[12] In Table 3, we use both players and non-player samples. The results are similar when conducting the exogeneity test using the sample of players, which are available upon request.

Table 2
Characteristics of Household Members.

	With lottery players (1)	Without lottery players (2)
A. Health related outcomes		
Self-reported health score	2.71 (.83)	2.87 (.87)
Pr(excellent, very good, or good health)	.61 (.48)	.68 (.47)
Chronic conditions		
Pr(Have Hypertension)	.10 (.30)	.08 (.27)
Pr(Have Diabetes)	.06 (.24)	.05 (.22)
Pr(Have Cancer)	.01 (.10)	.01 (.08)
Pr(Have Heart Problem)	.02 (.15)	.02 (.15)
Pr(Have Stroke)	.004 (.07)	.002 (.05)
Pr(Have Arthritis)	.03 (.17)	.03 (.17)
Pr(Have Psychiatric Problem)	.01 (.07)	.01 (.08)
Total out-of-pocket medical spending per month	S$139.2 (314.9)	S$131.3 (323.4)
Spending for cigarette per month	S$19.5 (67.8)	S$11.3 (51.0)
Overall life satisfaction score	3.46 (.73)	3.57 (.76)
B. Other characteristics		
Age	60.7 (6.56)	60.24 (6.44)
Completed tertiary education	.34 (.47)	.45 (.50)
Completed secondary education	.44 (.50)	.36 (.48)
Male	.49 (.50)	.43 (.50)
Chinese	.94 (.23)	.77 (.42)
Malay	.01 (.09)	.13 (.33)
Indian	.03 (.18)	.08 (.26)
Number of children	2.87 (1.06)	2.94 (1.23)
Household income	S$61,086 (352,633)	S$62,689 (238,983)
Number of household members	4.05 (1.29)	4.08 (1.38)
Home ownership	.92 (.26)	.90 (.30)
Employment status	.57 (.50)	.50 (.50)
Full-time status	.43 (.49)	.37 (.48)
Private transfers	S$264 (534)	S$196 (452)
Risk preference score	3.46 (2.45)	3.47 (2.57)
Sample size	7,938	5,103

Notes: Monetary units are in 2016 Singapore dollars. Standard deviations are in parentheses.

Then we compare our estimates of the causal effects of lottery wins on health to income-health gradients among lottery players by following Östling et al. (2020). We construct a proxy for household permanent income by calculating the average household income over all survey waves. Columns (1) and (2) of Table A2 report the estimated associations between income and health. Panel A indicates that, among lottery players, the permanent-income measure is positively associated with health status. A S$10,000 increase in a household's permanent income is associated with a 0.194-point improvement in self-reported health status and a 10.3 percentage points increase in the probability that self-reported health status is good, very good, or excellent. The estimates are statistically significant at the 1 percent level. To guarantee the representativeness of estimated income gradients using lottery players, Östling et al. (2020) demonstrate that the permanent-income gradients of lottery players are similar to those of respondents in other nationally representative survey data. Unfortunately, we cannot conduct such a comparison because the SLP is the only large-scale survey data in Singapore available to the authors. To alleviate this issue, we estimate the income gradients using the whole survey sample, and Panel B shows that the results are similar.

The comparisons to the baseline estimates in Panel A of Table 4 indicate that, although the differences are statistically insignificant, the estimates of the income gradients are biased upwards.[13] For example, the association between permanent income and health is larger than the effects of lottery wins on health by 30–40%. This result is consistent with the findings of Lindqvist et al. (2020) and Östling et al. (2020) in that income gradients overemphasize the true effects of income on health. These differences between income gradients and the causal effects of income have two implications. First, the upward bias in income gradients is likely due to the omitted variable bias. Several factors related to both income and health might overemphasize the role of income in improving health. Second, the magnitudes of the income gradient estimates in our Singapore data (0.252 per $10 K) are much larger than that of Östling et al. (2020) in Sweden (0.080 per $10 K). This difference could be because household income is likely to play a bigger role in a country like Singapore that does not offer strong social safety nets than in Sweden or other Western European countries with strong social safety nets.

To compare our estimate with the findings from the existing literature, we identified seven papers directly related to our study in the literature: Lindahl (2005), Gardner and Oswald (2007), Apouey and Clark (2015), Cesarini et al. (2016), Raschke (2019), Lindqvist et al.

[13] p-values for the test of equality between the baseline estimate and the estimate of the income-health gradient are 0.45 and 0.32 for self-reported health status score and the probability that self-reported health status is good, very good, or excellent, respectively.

Table 3
Relationship between Lottery Prize and Covariates.

Dep. Var.: Lottery Prize/10,000	
Lottery ticket spending/10,000	0.123***
	(0.022)
Age	0.002
	(0.003)
Age squared/100	−0.003
	(0.003)
Completed tertiary education	−0.005
	(0.008)
Completed secondary education	0.004
	(0.007)
Male	0.004
	(0.004)
Chinese	−0.006
	(0.017)
Malay	−0.024
	(0.019)
Indian	−0.012
	(0.023)
1[Year = 2017]	0.017***
	(0.006)
Number of children	0.000
	(0.003)
Household income/10,000	0.000
	(0.000)
Number of household members	0.002
	(0.003)
Home ownership	0.008
	(0.007)
Employment status	0.008
	(0.008)
Full-time status	0.000
	(0.008)
Private transfers	−0.000
	(0.000)
Risk preference score	0.000
	(0.002)
Constant	−0.014
	(0.095)
Observations	7,938
R-squared	0.105
F-test of joint significance of all covariates except lottery ticket spending (p-value), w/o the year dummy	1.38 (0.146)
F-test of joint significance of all covariates except lottery ticket spending (p-value), w/ the year dummy	1.47 (0.103)

Notes: Standard errors clustered at the household level and corrected for heteroscedasticity are reported in parentheses. District fixed effects are included but the coefficient estimates are not reported. * denotes significance at 0.10, ** at 0.05, and *** at 0.01.

(2020), and Östling et al. (2020). Following Lindqvist et al. (2020) and Östling et al. (2020), we calculate the rescaled health impact of winning a US$100,000 lottery prize (in 2011 US$) in terms of SD units using six papers except for Cesarini et al. (2016).[14] Table A3 shows that the magnitude of our estimate is much larger than those of most previous studies but is similar to that of the mental health impact

Table 4
The Effects of Lottery Prize on Health Status.

Dependent variables:	Health status (1)	Pr(Health>= Good) (2)
A. Baseline specification		
Lottery Prize/10,000	0.149***	0.073***
	(0.053)	(0.026)
Observations	7,938	7,938
R-squared	0.052	0.044
B. Baseline specification w/o controlling for ticket spending		
Lottery Prize/10,000	0.122**	0.059**
	(0.053)	(0.033)
Observations	7,938	7,938
R-squared	0.051	0.001
C. No control variables		
Lottery Prize/10,000	0.154***	0.075***
	(0.050)	(0.025)
Observations	7,938	7,938
R-squared	0.002	0.001

Notes: All specifications include age, age squared, dummy variables indicating post-secondary education, secondary education, gender, race/ethnicity, the calendar year 2017, number of children, household income, number of household members, home ownership, employment status, full-time work status, private transfers, risk preference scores, district fixed effects, and spending on lottery tickets. Standard errors clustered at the household level and corrected for heteroscedasticity are reported in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

reported in Gardner and Oswald (2007). This reflects the possibility that the causal effects of income on health could vary across settings. As a possible explanation, we argue that a difference in the intensity of social safety nets might play an important role in reconciling these differences (Cesarini et al., 2016).

We acknowledge that it is difficult to pinpoint whether the difference between the findings of this study and those of previous studies based on the Western European countries is only due to the differences in social safety nets offered. For example, unlike the previous studies using survey data (Lindahl, 2005; Gardner and Oswald, 2007; Apouey and Clark, 2015; Raschke, 2019), we control for lottery ticket spending in the regression analysis, which can affect the magnitudes of estimates to the extent that lottery players are systematically different by lottery ticket spending. To indirectly examine the role of controlling for lottery ticket spending, we re-run the baseline regression analysis after excluding ticket spending. The effects of lottery wins on self-reported health status are similar to those of the baseline analysis that controls for lottery ticket spending. Panel B of Table 4 indicates that the estimates of the baseline specification without controlling for ticket spending are slightly smaller in magnitude than those in Panel A.[15] This result implies that the positive health impact of winning the lottery is less likely to be driven by controlling for ticket spending.

[14] We could not calculate the standardized effects of lottery wins on adult mortality rate because Cesarini et al. (2016) do not provide information on SD of adult mortality rate from the paper. However, the estimated morality impact is close to zero, which implies that the standardized impact would also be close to zero.

[15] The differences in estimates are statistically insignificant. p-values for the test of equality between estimates in Panels A and B are 0.11 and 0.15 for self-reported health status score and the probability that self-reported health status is good, very good, or excellent, respectively.

To check the robustness of the baseline findings, we conduct several checks. First, we re-estimate Eq. (1) by excluding all control variables except for lottery ticket spending. If the variations in lottery prizes were randomly given, the inclusion of control variables would not significantly affect the magnitude of the estimates. Consistent with this conjecture, Panel C of Table 4 shows that the estimates without control variables remain similar to the baseline estimates that include all control variables.[16]

Second, we consider alternative standard errors. Analytic standard errors reported in Table 4 may be inappropriate in the presence of small sample bias due to highly skewed lottery prize data (Cesarini et al., 2016; Picchio et al., 2018). For robust inference, we construct an empirical sampling distribution under the null hypothesis that the effect of winning a lottery prize on health is zero. We conduct Monte Carlo simulations following Cesarini et al. (2016) and Picchio et al. (2018) and generate 1000 datasets in which the lottery prize data are randomly permuted. We estimate Eq. (1) and store the estimated coefficient values using these 1000 permuted samples. Panel A of Fig. 1 shows the distribution of the estimated effects of *fake* lottery prizes on health outcomes. The estimates are normally distributed around zero. Panel B demonstrates the same distributions with the baseline estimates indicated by the vertical lines. It shows that the baseline estimates are located far outside the distributions. As a result, the distribution of the estimated fake treatment effects seems like a spike. All corresponding p-values are less than 0.0001, which implies that our statistical inference is robust using an alternative method.

Third, we re-estimate Eq. (1) using the ordered logit model to address the ordinal nature of the overall health status variable. Panel A of Table A4 shows that the estimate is statistically significant at the 1% level. Panel B shows the average marginal effects of winning a lottery prize of S$10,000 on each category of health status. An increase in unearned income via lottery wins decreases the probabilities of poor and fair health statuses by 2.0 and 6.2 percentage points, respectively, while it increases the probabilities of good, very good, and excellent health statuses by 3.9, 3.7, and 0.6 percentage points, respectively.

We then examine the heterogeneous health effects using the degree of liquidity constraints. Since it is hard to directly measure liquidity constraints faced by individuals, we exploit a unique policy rule that provides individuals with access to credit after their 55th birthday. In Singapore, local residents are allowed to withdraw a portion of their pension wealth upon turning 55. On average, about 40% of people withdraw S$32,852 (US$23,792) in the year they turn 55 (Kim and Koh, 2020b). This institutional setting creates an exogenous variation in the degree of liquidity constraints. Those aged under 55 would experience stronger liquidity constraints than those aged 55 and over. To examine how the health effects of income vary by the degree of liquidity constraints imposed by the public pension balance withdrawal policy, we estimate Eq. (1) separately for those aged 53 and 54 and those aged 55 and 56, respectively.[17] Columns (1) to (4) of Table 5 show that the effects of lottery wins on health are larger among those who are ineligible for the pension withdrawal. This result implies that the health effects of an additional gain in unearned income may be greater among those with stronger liquidity constraints. However, it should be noted that the differences in the estimates are statistically insignificant.

To better understand the health effects of lottery wins, we conduct four additional analyses. First, we estimate the effects of lottery wins on the incidence of health conditions. We examined the effects of lottery wins on self-reported overall health status, which is subjective in its nature. Thus, to complement this measure, we use self-reported but more objective measures for health status. Table A5 reports the effects of lottery wins on the incidence of health conditions as diagnosed by doctors. The results indicate that winning a $10,000 lottery prize reduces the incidence of cancer and psychiatric problems by 0.9 and 0.2 percentage points, respectively. The estimates are statistically significant at the 5% level. However, the results do not provide evidence that lottery wins reduce the incidence of other health conditions such as hypertension, diabetes, heart problems, stroke, and arthritis. To interpret the results, we acknowledge that it is difficult to rationalize the short-term effects of lottery wins on the incidence of a chronic condition such as cancer diagnosis. To the best of our knowledge, there is no medical literature supporting this result. Then, to interpret our findings, we closely re-examined the estimation results. The magnitude of the cancer diagnosis estimate is similar to those of other chronic conditions such as hypertension. However, those other chronic conditions have larger standard errors, while the diagnosis of diabetes even has a positive sign. Based on this inconsistency in the estimation results across several chronic conditions measures along with the lack of consistent evidence in the medical literature, we suggest that it is unlikely that lottery wins reduced the incidence of chronic conditions within a short period.

Second, we examine lagged health effects of lottery wins. In the existing literature, Cesarini et al. (2016) and Lindqvist et al. (2020) examine longer-term health impact of lottery wins by using lottery players' long-term measures on adult health and subjective well-being, respectively. So far, we only considered immediate health impacts. As a complementary analysis, we use the health status one year after the lottery win as an additional outcome. Table A6 indicates that the effects of winning a S$10,000 lottery prize on self-reported health status one year after winning remain statistically significant, but the magnitudes reduce. This evidence implies that the estimated health improvements may not simply dissipate in

[16] The test of exogeneity reported in Table 3 indicates that the year dummy is statistically significantly associated with lottery prizes, probably because the lottery prize structure changes over time. To test if this result causes bias in estimating the causal effect of lottery wins on health, we exclude only the year dummy and re-estimate equation (1). The regression results, which are available upon request, remain robust.

[17] To ensure that samples have similar characteristics other than the degree of liquidity constraints, we restrict the sample to a narrow range around the policy cutoff age of 55.

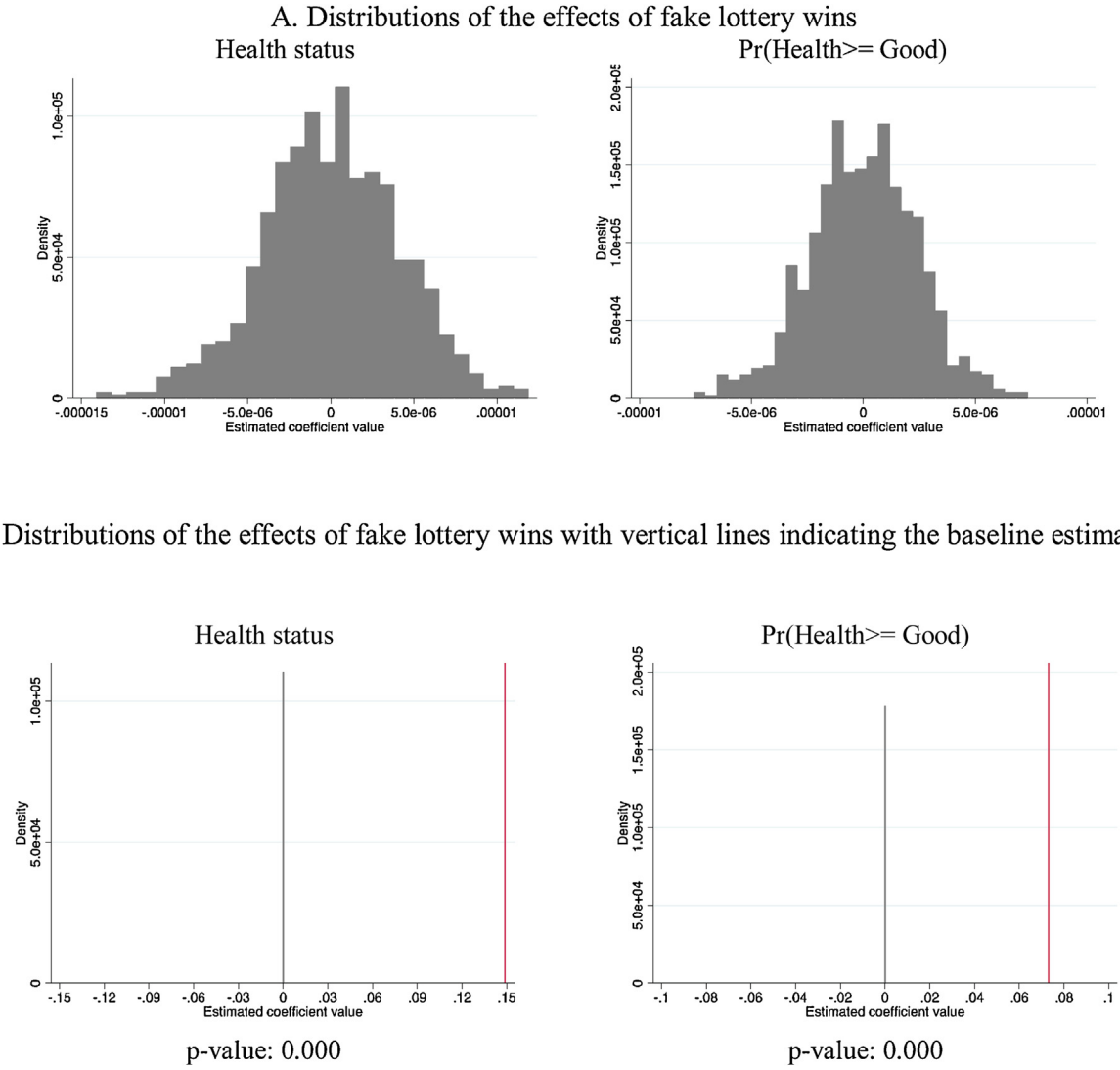

Fig. 1. Permutation Test.
A. Distributions of the effects of fake lottery wins.
B. Distributions of the effects of fake lottery wins with vertical lines indicating the baseline estimates.
Notes: All specifications include age, age squared, dummy variables indicating post-secondary education, secondary education, gender, Race/ethnicity, the calendar year 2017, number of children, household income, number of household members, home ownership, employment status, full-time work status, private transfers, risk preference scores, district fixed effects, and spending on lottery tickets.

Table 5
Heterogeneous Effects of Lottery Prize on Health Status by Public Pension Balance Withdrawal Policy.

Dep var:	Health status		Pr(Health>= Good)	
Age groups:	53–54 years	55–56 years	53–54 years	55–56 years
	(1)	(2)	(3)	(4)
Lottery Prize/10,000	0.212**	0.133*	0.119**	0.096***
	(0.104)	(0.074)	(0.047)	(0.034)
Observations	897	901	897	901
R-squared	0.143	0.118	0.135	0.107

Notes: All specifications include age, age squared, dummy variables indicating post-secondary education, secondary education, gender, race/ethnicity, the calendar year 2017, number of children, household income, number of household members, home ownership, employment status, full-time work status, private transfers, risk preference scores, district fixed effects, and spending on lottery tickets. Standard errors clustered at the household level and corrected for heteroscedasticity are reported in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

the short term; however, the results do not indicate longer-term effects of lottery wins due to the lack of data.

Third, we investigate non-linear effects of lottery wins on health. In the baseline analysis, we assume that health status and lottery prize have a linear relationship, which may be restrictive when the true relationship is non-linear. To address this limitation, we consider a more flexible relationship by conducting a non-parametric estimation. Since lottery prizes would not be randomly determined if we do not control for ticket spending, we calculate variations in lottery prizes and health status using the Frisch-Waugh-Lovell theorem.[18] To examine a non-parametric relationship between lottery prizes and health status after removing the effects of lottery ticket spending, we run kernel-weighted local linear regression with the epanechnikov kernel function and a bandwidth of 0.8. Fig. A1 indicates that the nonparametric relationships between (residual) lottery prize amount and (residual) health status are generally positive linear, while they are slightly non-linear for the probability that health status is good, very good, or excellent when the lottery prize is large. It is noteworthy that there are no confidence intervals for large lottery prizes because there are only few observations.

Finally, we examine the effects of household income via lottery wins on household members' health status regardless of the individual's lottery-playing status. Since the lottery prizes may not be completely pooled within households (Lundberg et al., 1997; Ward-Batts, 2008), we divide the sample by players and non-players.[19] Table A7 shows that health effects are similar between players and non-players.

4.2. Possible mechanisms

In this subsection, we investigate possible mechanisms through which income affects health. We do not attempt to isolate the relative importance of each mechanism. Instead, we estimate the effects of lottery wins on a comprehensive set of outcome variables that can potentially mediate the relationship between income and health. The results are reported in Table 6.[20]

First, individuals can improve their health status via income because a higher income enables them to increase their healthcare spending (Grossman, 1972). To test this mechanism, we estimate the effect of lottery wins on healthcare spending. Column (1), however, shows that the estimate is small in magnitude and statistically insignificant, which is similar to the healthcare utilization impact of lottery wins in Sweden (Cesarini et al., 2016). The results reported in Table A8 are similar when separately estimating the effects of lottery wins on health insurance premium, prescribed medicines, other drugs, outpatient care, inpatient care, and home nursing. An increase in income may not increase individuals' healthcare spending due to Singapore's unique policy setting. It is compulsory for all Singaporeans to hold a mandatory medical savings account called Medisave, which is a major component of the social security savings system (the Central Provident Fund). Singaporeans can withdraw balances from the Medisave account to pay for healthcare spending when they or their immediate family members incur medical expenditure regardless of age. Therefore, an increase in income may have little impact on healthcare spending.

Second, although Column (1) of Table 6 does not indicate that lottery wins increase healthcare spending, the transitory income gains can increase other consumption spending in the presence of liquidity constraints, which in turn improves health status.[21] We estimate the effects of lottery wins on total consumption spending, excluding spending on healthcare and cigarettes. Column (2) shows that a S$10,000 increase in lottery winnings raises monthly household consumption spending by S$463.[22] The estimate is statistically significant at the 1% level. The estimate implies that the annual marginal propensity to consume is about 55%, which is greater than those in the Netherlands (Kuhn et al., 2011).

Third, lottery wins can improve health via increased leisure spending. Column (3) indicates that lottery wins do not reduce the probability of employment in our study.[23] However, Cesarini et al. (2017) and Picchio et al. (2018) document that lottery wins significantly reduce labor supply in Sweden and the Netherlands, respectively. One possible explanation regarding the differences in our results from these European studies is that the estimated health improvements in our study could have also raised labor productivity, thereby raising the opportunity cost of not working, or could have reduced the probability of absence from work (Grossman, 1972).

Fourth, an unexpected income gain can reduce stress, and thus improve health status (Deaton, 2002). Unfortu-

[18] We first run separate regressions of lottery prizes and health status on lottery ticket spending. We then calculate residuals from each regression. It is noteworthy that residual values for health status and lottery prizes could be negative, and thus, it is difficult to directly interpret their values.

[19] By construction, this analysis includes only lottery-playing households with the presence of a non-playing spouse. We also estimate the effects of lottery prizes on health status among lottery players with and without non-playing spouses. The results are similar to those of Panel A and are available upon request.

[20] Columns (3) to (7) of Table A2 report the estimated associations of income with outcome variables used for the mechanism analysis. Panel A presents that permanent-income is positively associated with medical spending, total consumption spending, the probability of employment, and overall life satisfaction but is negatively correlated with cigarette spending. Panel B shows that the results remain robust when estimating the income gradients using the whole survey sample. All estimates are statistically significant at the 1 percent level. Comparisons between panel A of Tables A2 and 6 indicate that the estimated income gradients overemphasize the true effects of income on medical expenditure, consumption spending, labor supply, subjective well-being, and spending on cigarette smoking. The differences in estimates are also stistically significant (The p-values are 0.01, less than 0.01, less than 0.01, 0.01 and 0.04 for total medical spending, total consumption spending, the probability of employment, overall life satisfaction, and spending for cigarette smoking, respectively).

[21] Consumption and health could be complementary (Finkelstein et al., 2013; Low and Pistaferri, 2015).

[22] We acknowledge that a version of this result is originally reported in Kim and Koh (2020a), but we use a different unit of analysis. The annualized marginal propensity to consume is about $5,558, which accounts for about 56% of the lottery prizes won.

[23] The results are similar when estimating the effects of lottery wins on the probability of full-time work.

Table 6
The Effects of Lottery Prize on Consumption Spending, Labor Supply, and Overall Life Satisfaction.

Dependent Variables:	Total out-of-pocket medical spending (1)	Total consumption spending (2)	Pr(employed) (3)	Overall life satisfaction (4)	Cigarette spending (5)
Lottery Prize/10,000	29.10	463.2***	0.013	0.134***	8.173
	(49.14)	(209.5)	(0.036)	(0.047)	(5.281)
Observations	7,938	7,938	7,938	7,935	7,926
R-squared	0.060	0.328	0.139	0.050	0.052

Notes: All specifications include age, age squared, dummy variables indicating post-secondary education, secondary education, gender, race/ethnicity, the calendar year 2017, number of children, household income, number of household members, home ownership, employment status, full-time work status, private transfers, risk preference scores, district fixed effects, and spending on lottery tickets. Standard errors clustered at the household level and corrected for heteroscedasticity are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

nately, we do not have access to information on an objective measure of stress such as cortisol or fMRI image. Motivated by Graham (2008), we, therefore, indirectly examine this channel by estimating the effects of lottery wins on overall life satisfaction. Column (4) reports that a S$10,000 increase in lottery winnings raises overall life satisfaction by 0.134 points (0.18 of SD), which is statistically significant at the 1% level.[24] The results are similar to those in the UK (Gardner and Oswald, 2007; Apouey and Clark, 2015)

Finally, we examine if lottery wins encourage risky health behavior, which could neutralize the beneficial health impacts of positive income shocks (Adda et al., 2009; Van Kippersluis and Galama, 2014; Gross and Tobacman, 2014). Column (5) indicates that the estimate of annual spending on cigarettes is small in magnitude and statistically insignificant, different from the previous study providing evidence that lottery wins increase cigarette smoking and alcohol consumption in the UK (Apouey and Clark, 2015). However, we acknowledge that our analysis may not be comprehensive since we do not examine effects on alcohol consumption due to data limitations.

5. Conclusion

Although the positive association between income and health is well established, it is hard to identify the causal effects due to econometric challenges such as omitted variable bias and reverse causality. We overcome this limitation by exploiting quasi-experimental variations in unearned income via lottery wins. Using nationally representative data of Singaporeans aged 50–70 that contain information on both lottery prize and ticket spending amounts, we find evidence that winning the lottery improves self-reported health statuses. Although, this health improvement does not coincide with changes in healthcare utilization, labor supply, or risky health behavior, we observe simultaneous increases in total consumption spending and improvements in overall life satisfaction after lottery wins.

Recent evidence suggests null health impacts of lottery wins except for mental health, but these data come from European countries that offer strong social safety nets (Apouey and Clark, 2015; Cesarini et al., 2016; Raschke, 2019). The current study provides new evidence of positive health effects of lottery wins in the absence of strong social safety nets, allowing us to comprehensively understand the health effects of income.

We cannot overlook the limitations of this study. First, we use lottery wins to exploit exogenous variations in income. Some behavioral models such as mental accounting predict that individuals would respond differently based on the types of income. Hence, one may ask whether it is reasonable to extrapolate our results to draw policy implications on potential benefits of public cash transfers. However, existing evidence suggests that lottery winners do not squander their prizes (Kaplan, 1987; Eckblad and Von Der Lippe, 1994; Cesarini et al., 2017). Consumption responses to lottery wins are also consistent with the predictions of a standard life-cycle model with liquidity constraints (Fagereng et al., 2020; Kim and Koh, 2020a). Second, we mainly focus on contemporaneous health effects of lottery wins. While we examine the one-year impact of lottery wins and find relatively persistent effects, it would be interesting to examine longer-run effects when additional data become available.

[24] We acknowledge that a version of this result is originally reported in Kim and Oswald (2020), but we use different specifications and updated data.

Appendix A

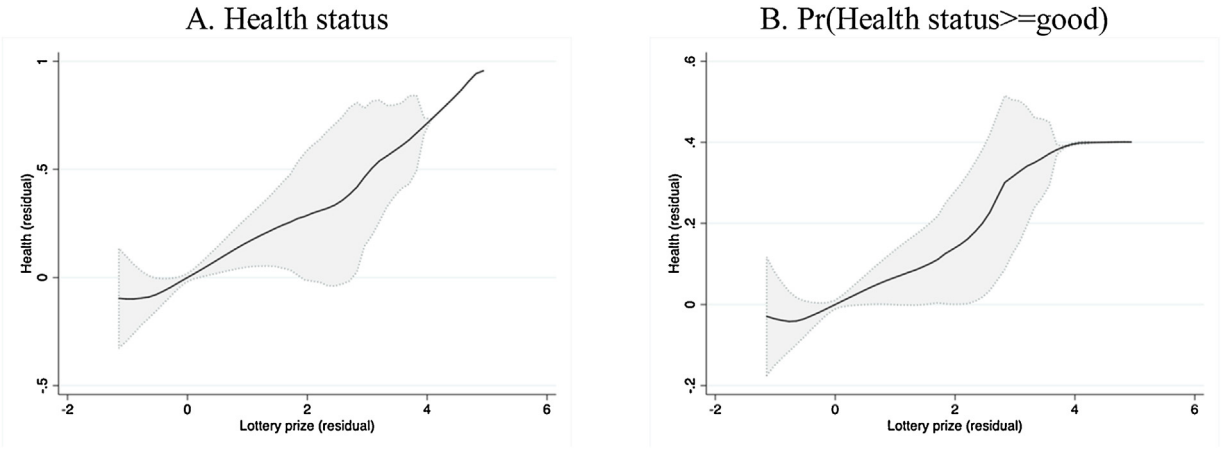

Fig. A1. Non-parametric Relationship between Lottery Prize and Health Status.
Notes: We run separate regressions of lottery prize and health status on lottery spending and calculate residuals from each regression. We then plot smoothed relationships between residuals of lottery prizes and health status using the running-mean smoother and a bandwidth of 0.8.

Table A1
The Effects of Lottery Prize on Health Status.

Regression Results for All Covariates		
Dependent variables:	Health status (1)	Pr(Health>= Good) (2)
Lottery Prize/10,000	0.149***	0.073***
	(0.053)	(0.026)
Lottery ticket spending/10,000	−0.040*	−0.021
	(0.024)	(0.014)
Age	−0.009	0.002
	(0.021)	(0.011)
Age squared	0.003	−0.002
	(0.018)	(0.009)
Completed tertiary education	0.085**	0.073***
	(0.038)	(0.021)
Completed secondary education	0.046	0.049**
	(0.034)	(0.019)
Male	−0.049**	−0.028**
	(0.022)	(0.013)
Chinese	−0.049	−0.043
	(0.087)	(0.052)
Malay	−0.058	−0.038
	(0.156)	(0.091)
Indian	−0.059	−0.028
	(0.114)	(0.066)
1[Year = 2017]	−0.007	−0.012
	(0.013)	(0.008)
Number of children	0.019	0.007
	(0.016)	(0.009)
Household income/10,000	0.0006***	0.0006**
	(0.0002)	(0.0002)
Number of household members	0.015	0.004
	(0.012)	(0.007)
Home ownership	0.188***	0.074***
	(0.047)	(0.028)
Employment status	0.064*	0.045**
	(0.035)	(0.020)
Full-time status	−0.004	−0.001
	(0.034)	(0.020)
Private transfers	0.000	0.000
	(0.000)	(0.000)
Risk preference score	0.039***	0.019***
	(0.006)	(0.003)
Constant	2.703***	0.420

Table A1 (*Continued*)

Regression Results for All Covariates		
Dependent variables:	Health status (1)	Pr(Health>= Good) (2)
	(0.639)	(0.325)
Observations	7,938	7,938
R-squared	0.052	0.044

Notes: All specifications include age, age squared, dummy variables indicating post-secondary education, secondary education, gender, race/ethnicity, the calendar year 2017, number of children, household income, number of household members, home ownership, employment status, full-time work status, private transfers, risk preference scores, district fixed effects, and spending on lottery tickets. Standard errors clustered at the household level and corrected for heteroscedasticity are reported in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Table A2
Permanent-Income Gradients.

	Health status	Pr(Health>= Good)	Total out-of-pocket medical spending	Total consumption spending	Pr(employed)	Overall life satisfaction	Cigarette spending
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
A. Lottery players							
Lifetime income/10,000	0.194***	0.103***	138.8***	5,552.1***	0.179***	0.262***	−3.950**
	(0.020)	(0.012)	(7.36)	(57.34)	(0.011)	(0.017)	(1.589)
Observations	7,910	7,910	7,910	7,910	7,910	7,907	7,898
R-squared	0.018	0.014	0.046	0.568	0.137	0.031	0.019
B. Whole sample							
Lifetime income/10,000	0.211***	0.098***	132.9***	5,355.1***	0.171***	0.279***	−3.927***
	(0.015)	(0.008)	(5.49)	(44.71)	(0.008)	(0.013)	(1.074)
Observations	12,957	12,957	12,957	12,957	12,955	12,954	12,932
R-squared	0.025	0.018	0.047	0.554	0.127	0.044	0.010

Notes: We restrict the sample to lottery players. Lifetime income/10,000 is the average of household income during all survey waves. All specifications include age, age squared, gender, race/ethnicity, the calendar year 2017. Standard errors clustered at the household level and corrected for heteroscedasticity are reported in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Table A3
Comparison to Findings of the Previous Studies.

Authors	Health measures	Years since winning lottery	Rescaled impact (SE)
Lindahl (2005)	Health index	0–22	0.25 (0.13)
Lindahl (2005)	Mental health (# symptoms)	0–22	0.28 (0.12)
Gardner and Oswald (2007)	Mental health (GHQ-12)	2	2.95 (1.05)
Apouey and Clark (2015)	Mental health (GHQ-12)	2	1.30 (0.45)
Raschke (2019)	Physical health index	1	0.02 (0.19)
Lindqvist et al. (2020)	Mental health (GHQ-12)	5–22	0.037 (0.014)
Östling et al. (2020)	Self-reported overall health	5–22	0.013 (0.015)
This study	Self-reported overall health	0–1	2.91 (0.85)

Sources: Lindqvist et al. (2020); Östling et al. (2020) and the authors' own calculation.
Note: Rescaled estimates are effects of US$100,000 (in 2011 prices) on the outcome in terms of SD units following Lindqvist et al. (2020).

Table A4
Ordered Logit Estimation of the Effects of Lottery Prize on Health Status.

	(1)
A. Dependent variable: self-reported health status	
Lottery Prize/10,000	0.360***
	(0.125)
B. Average marginal effects	
Pr(Poor)	−0.020***
	(0.007)
Pr(Fair)	−0.062***
	(0.021)
Pr(Good)	0.039***
	(0.013)
Pr(Very good)	0.037***
	(0.013)
Pr(Excellent)	0.006***
	(0.002)
Observations	7,938
Pseudo R-squared	0.022

Notes: All specifications include age, age squared, dummy variables indicating post-secondary education, secondary education, gender, race/ethnicity, the calendar year 2017, number of children, household income, number of household members, home ownership, employment status, full-time work status, private transfers, risk preference scores, district fixed effects, and spending on lottery tickets. Standard errors clustered at the household level and corrected for heteroscedasticity are reported in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Table A5
The Effects of Lottery Prize on the Incidence of a Health Condition as Diagnosed by Doctors.

Health conditions	Hypertension (1)	Diabetes (2)	Cancer (3)	Heart problem (4)	Stroke (5)	Arthritis (6)	Psychiatric problem (7)
Lottery Prize/10,000	−0.009	0.007	−0.009**	−0.004	−0.002	−0.008	−0.002**
	(0.014)	(0.013)	(0.003)	(0.004)	(0.001)	(0.005)	(0.001)
Observations	7,936	7,936	7,936	7,936	7,936	7,936	7,936
R-squared	0.032	0.029	0.015	0.025	0.013	0.031	0.013

Notes: All specifications include age, age squared, dummy variables indicating post-secondary education, secondary education, gender, race/ethnicity, the calendar year 2017, number of children, household income, number of household members, home ownership, employment status, full-time work status, private transfers, risk preference scores, district fixed effects, and spending on lottery tickets. Standard errors clustered at the household level and corrected for heteroscedasticity are reported in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Table A6
The Effects of Lottery Prize on Health Status in t + 1.

Dependent variables:	Health status (1)	Pr(Health>= Good) (2)
Lottery Prize/10,000	0.113**	0.068**
	(0.047)	(0.026)
Observations	7,679	7,938
R-squared	0.050	0.041

Notes: All specifications include age, age squared, dummy variables indicating post-secondary education, secondary education, gender, race/ethnicity, the calendar year 2017, number of children, household income, number of household members, home ownership, employment status, full-time work status, private transfers, risk preference scores, district fixed effects, and spending on lottery tickets. Standard errors clustered at the household level and corrected for heteroscedasticity are reported in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Table A7
The Effects of Lottery Prize on Health Status.

Lottery Players and Non-players		
Dependent variables:	Health status (1)	Pr(Health>= Good) (2)
A. Lottery players		
Lottery Prize/10,000	0.233** (0.105)	0.102* (0.059)
Observations	960	960
R-squared	0.126	0.133
B. Non-players		
Lottery Prize/10,000	0.178** (0.081)	0.111** (0.056)
Observations	992	992
R-squared	0.107	0.102

Notes: All specifications include age, age squared, dummy variables indicating post-secondary education, secondary education, gender, race/ethnicity, the calendar year 2017, number of children, household income, number of household members, home ownership, employment status, full-time work status, private transfers, risk preference scores, district fixed effects, and spending on lottery tickets. Standard errors clustered at the household level and corrected for heteroscedasticity are reported in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Table A8
The Effects of Lottery Prize on Other Healthcare Spending.

Dep. Vars.	Monthly healthcare spending					
	Health insurance premiums (1)	Prescribed medicine (2)	Other drugs (3)	Outpatient care (4)	Inpatient care (5)	Home nursing (6)
Lottery Prize/10,000	41.5 (26.9)	1.7 (7.4)	−0.3 (3.8)	−5.3 (4.9)	−5.3 (4.9)	7.9 (7.6)
Observations	7,930	7,932	7,929	7,930	7,930	7,927
R-squared	0.13	0.07	0.06	0.07	0.07	0.02

Notes: All specifications include age, age squared, dummy variables indicating post-secondary education, secondary education, gender, race/ethnicity, the calendar year 2017, number of children, household income, number of household members, home ownership, employment status, full-time work status, private transfers, risk preference scores, district fixed effects, and spending on lottery tickets. Standard errors clustered at the household level and corrected for heteroscedasticity are reported in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

References

Adda, J., Banks, J., Von Gaudecker, H.M., 2009. The impact of income shocks on health: evidence from cohort data. J. Eur. Econ. Assoc. 7 (6), 1361–1399.

Apouey, B., Clark, A.E., 2015. Winning big but feeling no better? The effect of lottery prizes on physical and mental health. Health Econ. 24 (5), 516–538.

Baird, Sarah, de Hoop, Jacobus, Özler, Berk, 2013. Income shocks and adolescent mental health. J. Hum. Resour. 48 (2).

Briggs, Joseph, Cesarini, David, Lindqvist, Erik, Östling, Robert, 2020. Windfall gains and stock market participation. J. Financ. Econ., Forthcoming.

Cesarini, D., Lindqvist, E., Östling, R., Wallace, Björn, 2016. Wealth, health, and child development: evidence from administrative data on Swedish lottery players. Q. J. Econ. 131 (2), 687–738.

Cesarini, David, Lindqvist, Erik, Notowidigdo, Matthew J., Östling, Robert, 2017. The effect of wealth on individual and household labor supply: evidence from Swedish lotteries. Am. Econ. Rev. 107 (12), 3917–3946.

Cheng, T.C., Costa-Font, J., Powdthavee, N., 2018. Do you have to win it to fix it? A longitudinal study of lottery winners and their health-care demand. Am. J. Health Econ. 4 (1), 26–50.

Choon, C.N., 2010. Social protection in Singapore: targeted welfare and asset-based social security. In: Asher, M.G., Oum, S., Parulian, F. (Eds.), Social Protection in East Asia – Current State and Challenges. ERIA Research Project Report 2009-9. ERIA, Jakarta, pp. 90–123.

Chung, W., Ha, H., Kim, B., 2016. Money transfer and birth weight: evidence from the Alaska permanent fund dividend. Econ. Inq. 54 (1), 576–590.

Cutler, David M., Lleras-Muney, A., Vogl, T., 2012. Socioeconomic status and health: dimensions and mechanisms. In: The Oxford Handbook of Health Economics.

Deaton, A., 2002. Policy implications of the gradient of health and wealth. Health Aff. 21 (2), 13–30.

Doherty, D., Gerber, A.S., Green, D.P., 2006. Personal income and attitudes toward redistribution: a study of lottery winners. Polit. Psychol. 27 (3), 441–458.

Eckblad, G.F., Von Der Lippe, A.L., 1994. Norwegian lottery winners: cautious realists. J. Gambl. Stud. 10 (4), 305–322.

Evans, W.N., Garthwaite, C.L., 2014. Giving mom a break: the impact of higher EITC payments on maternal health. Am. Econ. J. Econ. Policy 6 (2), 258–290.

Fagereng, A., Holm, M.B., Natvik, G.J.J., 2020. MPC Heterogeneity and Household Balance Sheets, Working paper.

Finkelstein, Amy, Luttmer, Erzo F.P., Notowidigdo, Matthew J., 2013. What good is wealth without health? The effect of health on the marginal utility of consumption. J. Eur. Econ. Assoc. 11, 221–258.

Frijters, P., Haisken-DeNew, J.P., Shields, M.A., 2005. The causal effect of income on health: evidence from German reunification. J. Health Econ. 24 (5), 997–1017.

Gardner, J., Oswald, A.J., 2007. Money and mental wellbeing: a longitudinal study of medium-sized lottery wins. J. Health Econ. 26 (1), 49–60.

Graham, C., 2008. Happiness and health: lessons and questions for public policy. Health Aff. 27 (January–February).

Gross, T., Tobacman, J., 2014. Dangerous liquidity and the demand for health care evidence from the 2008 stimulus payments. J. Hum. Resour. 49 (2), 424–445.

Grossman, M., 1972. On the concept of health capital and the demand for health. J. Polit. Econ. 80 (2), 223–255.

Hankins, S., Hoekstra, M., 2011. Lucky in life, unlucky in love? The effect of random income shocks on marriage and divorce. J. Hum. Resour. 46 (2), 403–426.

Hankins, S., Hoekstra, M., Skiba, P.M., 2011. The ticket to easy street? The financial consequences of winning the lottery. Rev. Econ. Stat. 93 (3), 961–969.

Haskins, Ron., 2011. Social policy in Singapore: a crucible of individual responsibility. Ethos: J. Soc. Psychol. Anthropol. (9).
Haushofer, J., Shapiro, J., 2016. The short-term impact of unconditional cash transfers to the poor: experimental evidence from Kenya. Q. J. Econ. 131 (4), 1973–2042.
Imbens, G.W., Rubin, D.B., Sacerdote, B.I., 2001. Estimating the effect of unearned income on labor earnings, savings, and consumption: evidence from a survey of lottery players. Am. Econ. Rev., 778–794.
Kaplan, H.Roy., 1987. Lottery winners: they myth and reality. J. Gambl. Behav. 3 (3).
Kim, Seonghoon, Koh, Kanghyock, 2020a. Consumption Responses to Income Shocks Through Lottery Winning, Working Paper.
Kim, Seonghoon, Koh, Kanghyock, 2020b. Does early access to pension wealth improve health? Econ. Inq. 58 (4), 1783–1794.
Kim, Seonghoon, Oswald, Andrew J., 2020. Happy lottery winners and LT bias. Rev. Income Wealth, forthcoming.
Kuhn, P., Kooreman, P., Soetevent, A., Kapteyn, A., 2011. The effects of lottery prizes on winners and their neighbors: evidence from the Dutch postcode lottery. Am. Econ. Rev. 101 (5), 2226–2247.
Lindahl, M., 2005. Estimating the effect of income on health using lottery prizes as exogenous source of variation in income. J. Hum. Resour. 40, 144–168.
Lindh, T., Ohlsson, H., 1996. Self-employment and windfall gains: evidence from the Swedish lottery. Econ. J. 106, 1515–1526.
Lindqvist, Erik, Östling, Robert, Cesarini, David, 2020. Long-run effects of lottery wealth on psychological well-being. Rev. Econ. Stud. 87 (6), 2703–2726.
Low, H., Pistaferri, L., 2015. Disability insurance and the dynamics of the incentive insurance trade-off. Am. Econ. Rev. 105 (10), 2986–3029.
Lundberg, S.J., Pollak, R.A., Wales, T.J., 1997. Do husbands and wives pool their resources? Evidence from the United Kingdom child benefit. J. Hum. Resour., 463–480.
Markle, T., La Fleur, B., La Fleur, B., 2014. La Fleur's 2014 World Lottery Almanac. TLF Publications.
Markle, T., La Fleur, B., La Fleur, B., 2018. La Fleur's 2018 World Lottery Almanac. TLF Publications.
Östling, R., Cesarini, D., Lindqvist, E., 2020. Association between lottery prize size and self-reported health habits in Swedish lottery players. JAMA Netw. Open 3 (3), e1919713.
Picchio, M., Suetens, S., Van Ours, J.C., 2018. Labour supply effects of winning a lottery. Econ. J. 128, 1700–1729.
Raschke, Christian, 2019. Unexpected windfalls, education, and mental health: evidence from lottery winners in Germany. Appl. Econ. 51 (2), 207–218.
van Kippersluis, H., Galama, T.J., 2014. Wealth and health behavior: testing the concept of a health cost. Eur. Econ. Rev. 72, 197–220.
Ward-Batts, J., 2008. Out of the wallet and into the purse using micro data to test income pooling. J. Hum. Resour. 43 (2), 325–351.