

Original Article

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Corresponding author:

Cherise Rosen; Email: ccrosenphd@gmail.com

Using latent class analysis to investigate enduring effects of intersectional social disadvantage on long-term vocational and financial outcomes in the 20-year prospective Chicago Longitudinal Study

Nev Jones¹ , Liping Tong², Shannon Pagdon¹, Ikenna D. Ebuenyi³, Martin Harrow^{4,*}, Rajiv P. Sharma⁴ and Cherise Rosen⁴

¹School of Social Work, University of Pittsburgh, Pittsburgh, PA, USA; ²Advocate Aurora Health, Downers Grove, IL, USA; ³School of Health & Rehabilitation Sciences, University of Pittsburgh, Pittsburgh, PA, USA and ⁴Department of Psychiatry, University of Illinois at Chicago, Chicago, IL, USA

Abstract

Background. Class and social disadvantage have long been identified as significant factors in the etiology and epidemiology of psychosis. Few studies have explicitly examined the impact of intersecting social disadvantage on long-term employment and financial independence.

Methods. We applied latent class analysis (LCA) to 20-year longitudinal data from participants with affective and non-affective psychosis ($n = 256$) within the Chicago Longitudinal Research. LCA groups were modeled using multiple indicators of pre-morbid disadvantage (parental social class, educational attainment, race, gender, and work and social functioning prior to psychosis onset). The comparative longitudinal work and financial functioning of LCA groups were then examined.

Results. We identified three distinct latent classes: one comprised entirely of White participants, with the highest parental class and highest levels of educational attainment; a second predominantly working-class group, with equal numbers of Black and White participants; and a third with the lowest parental social class, lowest levels of education and a mix of Black and White participants. The latter, our highest social disadvantage group experienced significantly poorer employment and financial outcomes at all time-points, controlling for diagnosis, symptoms, and hospitalizations prior to baseline. Contrary to our hypotheses, on most measures, the two less disadvantaged groups did not significantly differ from each other.

Conclusions. Our analyses add to a growing literature on the impact of multiple forms of social disadvantage on long-term functional trajectories, underscoring the importance of proactive attention to sociostructural disadvantage early in treatment, and the development and evaluation of interventions designed to mitigate ongoing social stratification.

Introduction

In spite of a long history of epidemiological research on poverty, class, and race/ethnicity as predictors of psychosis risk (Anglin et al., 2021; Bebbington, 2015; Sideli et al., 2020), research regarding sociostructural influences on *functional trajectories* and *outcomes* remains far less developed (cf Cohen, 1993; Kelly, 2005; Read, 2010). Nevertheless, more recent studies have consistently identified substantial impacts of socioeconomic status (SES) on outcomes, and a recent re-analysis of RAISE clinical trial data found that participants in the *three* lower quartiles by SES did not benefit from the experimental intervention – specialized multidisciplinary services for first-episode psychosis – on even a single primary outcome (Bennett & Rosenheck, 2021). The core goal of the analyses described here, using 20-year longitudinal data from the Chicago Longitudinal Research Program (CLRP), was to investigate how multiple forms of social disadvantage, operationalized to include parental class, race, pre-morbid educational attainment, work functioning, and social functioning, impact long-term vocational outcomes and financial independence across a 20-year follow-up period.

Sociostructural determinants: working definition and integration in the mental health services literature

Broadly speaking, social and structural (or sociostructural) determinants of health refer to policies and structures, beyond individual deficits, behaviors, and genetics, that shape health outcomes and well-being. Examples of *structural* determinants include regional and national economic policy, healthcare policy and access, and structural manifestations of racism, classism, and

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ableism, while common examples of *social* determinants include income, SES, and educational access and attainment. While calls to respond to sociostructural determinants of health have gained significant traction in the past decade (e.g. Penman-Aguilar et al., 2016; Srinivasan and Williams, 2014; Wasserman et al., 2019), in the area of serious mental illness trajectories and outcomes they remain neglected (Cohen, 1993; Harper & Speed, 2012; Hopper, 2007; Karadzov, 2023; Rose, 2014). Instead, SMI service and outcome studies tend to prioritize diagnosis, psychopathology, and other individual-level clinical variables such as substance use and medication adherence (Ferrari et al., 2023). To quote Karadzov (2023) this widespread neglect of the ‘roles of inequalities, disadvantage and other structural conditions risks succumbing to a reductionist and potentially harmful view of recovery and mental well-being...as constituting little more than a function of individuals’ cognition, emotions, and volition’.

Class, race, and poverty in the United States

Temporarily bracketing serious mental illness, childhood social class, race, and their intersections are among the strongest predictors of long-term poverty in the United States (Corcoran, 2008; Lin & Harris, 2008). Beginning in early childhood, residents of poor, racially segregated neighborhoods are significantly more likely than middle-class White Americans to experience direct or parental incarceration (Pettit & Western, 2004; Wildeman, Goldman, & Turney, 2018), neighborhood violence (Minh, Muhajarine, Janus, Brownell, & Guhn, 2017; Stein, Jaycox, Kataoka, Rhodes, & Vestal, 2003), housing instability (Fowle, 2022; Shelton, Taylor, Bonner, & Van Den Bree, 2009), and food insecurity (Gundersen & Ziliak, 2014), among other forms of early social disadvantage, placing them at high risk for myriad negative outcomes. The intersection of race and socioeconomic status also strongly influences access to and quality of education received from early childhood (Henry, Votruba-Drzal, & Miller, 2019; Samaan, 2000; Rivkin, 1995) through emerging adulthood (Berg, 2016), in turn constraining career opportunities (Rivkin, 1995), lifetime earnings (Budig, Lim, & Hodges, 2021; McCall, 2001), and eventual quality of work (Gittleman & Howell, 1995). Collectively and synergistically, these determinants limit socioeconomic mobility in both the long and short-term, often trapping families in poverty across multiple generations.

Prior research on social disadvantage and outcomes in psychosis

In spite of an extensive epidemiological literature on the relationship between class, disadvantage on risk of psychosis onset (e.g. Byrne, Agerbo, Eaton, & Mortensen, 2004; Kwok, 2014; Turner & Wagenfeld, 1967), attention to social and structural disadvantage in the context of post-onset trajectories and outcomes, has been much more limited; and, even where present, often ideologically constrained. For example, in the early and mid-20th century, dominant eugenics discourse contributed to attention to class and race, but primarily through the lens of genetic inferiority (Dowbiggin, 2018). Conversely, mid-late century sociologists and antipsychiatrists, including Scheff (1970) and Szasz (1966), sought to recast ‘mental illness’ as a purely social construction, and contemporary diagnosis as attempts to mask the oppression of minority groups merely perceived to be deviant by those in power.

In reviewing and commenting on the literature on poverty and long-term outcomes in schizophrenia across multiple time points,

Cohen (1993; ref) observes that it is above all the integration of a more dynamic understanding of poverty, class, and ‘illness’ that has been most neglected in the field; for example, the ways in which poverty increases risk, but also shapes the structure, form, and content of symptoms, service users’ access to services and the quality of services offered, the ways in which service users engage with services, and ultimately the outcomes that result (Barnett et al., 2023). More isolated research can nevertheless be pieced together to help flesh out these processes and interactions. For example, studies demonstrate that childhood adversity not only increases risk but also leads to more severe symptoms, and that particular forms of adversity more strongly predict the emergence of particular symptoms. Social disadvantage impacts access to services but also the nature of the services offered, including likelihood of coercion (Maura & Weisman de Mamani, 2017; Sashidharan, Mezzina, & Puras, 2019), and the extent to which service users benefit, even when the intervention is ostensibly constant (Anglin et al., 2021; Shim et al., 2014). For example, Bennett and Rosenheck (2021) found that only those NIMH RAISE trial participants in the top socioeconomic quartile benefited on any primary outcome. Even among service users who begin with greater socioeconomic privilege, social and structural stigma, and discrimination mean that ‘downward mobility’ remains more typical than not. As a group, individuals with schizophrenia experience among the highest rates of unemployment, homelessness, criminalization, and residential segregation of any minority group in the US (e.g. Cloutier et al., 2016; Primeau, Bowers, Harrison, & XuXu, 2013). One large study of US Veterans with schizophrenia found that they were virtually all living at or below the poverty line (see Harvey et al., 2012).

As noted above, minoritized racial status strongly intersects with socioeconomic disadvantage, a relationship structurally reinforced through explicitly racialized policies governing public education, personal and home loans, infrastructure, public assistance, incarceration, and crime, among others (Perocco, 2022; Soss, Fording, & Schram, 2011). In the United States, Black (or African origin) Americans, the primary minority group present in the Chicago Longitudinal sample, have experienced particularly pronounced harms beginning with enslavement, and continuing through decades of both formal and informal segregation and discrimination. This backdrop of historical trauma and disadvantage unsurprisingly plays out in significantly elevated rates of psychosis (refs), but also, and consistently, the worst treatment (Barnett et al., 2019; Cook et al., 2014, 2015, 2017; Puyat et al., 2013; Vidal, Reynolds, Przglowski, & Grados, 2020) and worst outcomes (Maura & Weisman de Mamani, 2017; Mongelli, Georgakopoulos, & Pato, 2020; Morgan et al., 2017) of any ethnoracial group in the US.

Goals of the current study

Using 20-year follow-up data from the CLRP, we sought to examine potentially enduring impacts of social disadvantage on vocational outcomes. To do so, we identified latent class groups using race/ethnicity, parental social class, participant education at index hospitalization, and pre-morbid work and social functioning as indicators. In keeping with the rationale behind latent class analysis (LCA), we understand the above sociostructural factors as observed *indicators* of social advantage/disadvantage, and their combination as an important way to identify *latent* intersectional subpopulations (Muthén & Muthén, 2000). We then examined associations between latent group membership and vocational and financial outcomes at each follow-up over a 20-year trajectory.

Methods

Overview

We utilized data from the CLRP to investigate the extent to which underlying sociostructural (dis)advantage (as indexed by parental social class, highest level of education at baseline, race, age, and premorbid work and social functioning) predicts financial independence and work functioning over a 20-year follow-up period. Variable selection was informed by contemporary frameworks regarding the influence of class and race on access to and ability to pursue secondary and post-secondary education and ultimately living wage employment (cf Battle & Lewis, 2002; Braveman, Cubbin, Egarter, Williams, & Pamuk, 2010; Browman, Destin, Kearney, & Levine, 2019). We assume, that is, that parental class and race shape early trajectories of education, reflected in both educational attainment by young adulthood, and late adolescent and young adult work opportunities and perceived functioning. We thus explicitly re-conceptualize researcher-rated premorbid work and to a lesser extent social functioning as fundamentally bound up with and reflective of sociostructural disadvantage rather than (primarily) as psychiatric soft signs or premorbid manifestations of psychiatric disorder (cf Goodwin et al., 2018; McCarty, Liskey, George, Cook, & Metz, 2023).

Rationale for latent class analysis

The core premise underlying latent class analytics is that membership in unobserved (latent) classes has the potential to explain patterns of outcomes on assessment items and variables (Weller, Bowen, & Faubert, 2020). In the present analysis, that is, we hypothesize that participant's scores on the set of indicator variables we selected are driven by their class membership, in this case operationalized as relative intersectional social and structural (dis)advantage. Rather than focusing on single variables (e.g. race or parental social class alone), the operative premise is that social stratification unfolds most powerfully through the intersection of multiple forms of discrimination that interact synergistically over time, imposing 'interdependent negative effects' on affected individuals (Lu, Kong, Shelley, & Davitt, 2022). These multiple statuses must, per intersectionality theory, be modeled in combination. In studies with the goal of capturing intersectional disadvantage, LCA has been consistently recommended (Garnett et al., 2014; Earnshaw et al., 2018; Wilson & Urick, 2022).

Parent study

The CLRP is a prospective study designed to examine the naturalistic course of psychopathology, neurocognition, and recovery in individuals diagnosed with schizophrenia and primary mood disturbances (Bonner-Jackson, Grossman, Harrow, & Rosen, 2010; Grinker & Harrow, 1987; Harrow & Jobe, 2005b; Harrow, Jobe, Faull, & Yang, 2017; Harrow, Sands, Silverstein, & Goldberg, 1997, 2004; Harrow, Grossman, Jobe, & Herbener, 2005a; Humpston, Harrow, & Rosen, 2020; Jobe & Harrow, 2010; López-Silva et al., 2022; Rosen, Grossman, Harrow, Bonner-Jackson, & Faull, 2011; Rosen et al., 2022; Strauss, Harrow, Grossman, & Rosen, 2010). The CLRP was initiated in 1970 at two urban hospitals in the Chicago southside neighborhood. All individuals were evaluated during the acute phase of their index hospitalization and then reassessed at six subsequent follow-up evaluations over a 20-year period that occurred at approximately 2, 4.5, 7.5, 10, 15, and 20 years. Assessments were administered by trained research

assistants who were blind to the individuals' previous assessments and diagnoses. The Diagnostic and Statistical Manual Version III (American Psychiatric Association, 1980) was used to determine diagnostic specificity in addition to the Schedule for Affective Disorders and Schizophrenia (SADS; Endicott & Spitzer, 1978), the Schizophrenia State Inventory (Schwartz, Grinker, Harrow, & Holzman, 1978), and collateral information at index hospitalization. The Harrow Functioning Interview (HFI) was used to assess work performance and income status (Harrow et al., 1997). Specific questions from the functioning interview were used to score the Strauss-Carpenter Outcome Scale (SCS) for employment status as a measure of work performance (Strauss & Carpenter, 1972; Endicott & Spitzer, 1978). The study was approved by the University of Illinois at Chicago ethics review committee (IRB# 1997-0053). All individuals signed informed consent at baseline (index hospitalization) and at each subsequent follow-up.

Sub-sample

The current study included all individuals ≤ 32 years old diagnosed with a psychotic disorder and one or more follow-up ($n = 256$). Given a longitudinal study design, 32 participants without any follow-ups were excluded. In addition, we removed a small number ($n = 6$; age range 34–54) of participants whose index hospitalization occurred after the age of 32; the average age of these participants was 42. While later onset is well documented in the literature, for the purposes of a study focused on vocational outcomes and utilizing pre-morbid work functioning as an indicator, we were concerned that this small sub-group introduced more fundamental differences in course (and potentially underlying phenotype) and that the comparison of premorbid work functioning between young adults (in some cases with only a few years to have established a work history) and middle-aged adults (with as much as two decades of potential premorbid work behind them) was not theoretically or empirically justified.

Setting and historical context

The two hospitals that served as recruitment sites were the Illinois State Psychiatric Institute (ISPI; public hospital on the current grounds of the University of Illinois at Chicago medical campus) and Michael Reese Hospital (MRH; a private hospital serving higher SES patients). As has been previously reported, sample SES reflects this (with majority low SES participants in the ISPI sub-sample and higher SES participants at MRH). More generally, Chicago is (and has long been) one of the most racially segregated cities in the United States (Shedd, 2015), segregation characterized by concentrated rates of poverty in racial minority neighborhoods (Massey, 1990). It was in fact a Chicago-based sociologist, William Julius Wilson, who invented the term 'Black underclass', drawing a distinction between the Black working and middle classes, and those in communities impacted by markedly high rates of poverty, unemployment, welfare dependence, substance use, crime and gang violence (see Wilson, 1984; O'Connor, 2004). Key to Wilson's (1984) conceptualization was the simultaneous decline in jobs associated with deindustrialization in the American Midwest beginning in the '50s and the 'out-migration' of non-poor Black families, leading to more highly concentrated inner-city poverty and disadvantage. Simultaneously, mid-century Chicago was also home to waves of poor European immigrants, immigrants who initially worked in factories and mills, also facing

poverty and hardship as the steel and coal industries declined in the 50s and 60s.

Measures

Strauss–Carpenter Outcome Scale (SCS). The SCS was the primary measure used at follow-up evaluations to evaluate the longitudinal course of employment status (Strauss & Carpenter, 1972). Employment status as a measure of work performance was rated on a 5-point scale with scores ranging from ‘no useful work’ (0) to ‘employed continuously’ (4). Work performance was measured by the amount of time the individual had been employed in the past year, with higher scores reflecting a greater amount of time working.

HFI was obtained at baseline and subsequent follow-up evaluations over 20 years as a measure of functional outcome (Harrow et al., 1997; Jobe & Harrow, 2010; Racenstein, Penn, Harrow, & Schleser, 1999; Racenstein et al., 2002; Herbener & Harrow, 2004; Luther et al., 2020). For the purposes of this study, we included HFI items evaluating work performance and financial independence. HFI items were measured using a 5-point scale with scores ranging from the highest level of performance (1) to the lowest level of performance (5). Individual HFI items included (a) *current work performance* (‘work performance’), scores ranged from ‘employed full time, 32 h or more per week’ (1) to ‘unemployed or less than 5 h per week’ (5); (b) *number of jobs maintained or lost within the prior year* (‘number jobs’), scores ranged from ‘has not lost any jobs and is currently working’ (1) to ‘lost four or more jobs or continuously unemployed’ (5); (c) *time unemployed in the past year* (‘time unemployed’), scores ranged from ‘worked more than half the time throughout the year’ (1) to ‘unemployed throughout the year, or worked less than 3 months’ (5). The level of *financial independence* was measured by self and/or family support and scores ranged from ‘fully supports self and/or family or earns enough to be financially independent even though parents are providing part’ (1) to ‘completely dependent on others’ (5).

Parental social class. The two-item (job type and educational attainment) version of Hollingshead and Redlich’s (1958) index of parental social class was measured at baseline, using the adult head of household when the participant was 17.

Race. The two primary racial groups in the CLRP were Black (African-American or African-origin residents of Chicago) and White (or ‘Caucasian’ – predominantly European origin residents of Chicago).

Schedule for Affective Disorders and Schizophrenia (SADS). The prevalence of positive, negative, and general symptoms was assessed at each follow-up based on the year preceding the follow-up assessment (SADS; Endicott & Spitzer, 1978). Items were scored as absent (1), equivocal (suspected or weak, and/or occurring infrequently (2), or definitely present (3). For the purposes of this study, we included positive, anhedonia, depression, and anxiety at index hospitalization and positive and/or negative symptoms at each follow-up over 20 years.

Statistical analyses

We used LCA to identify latent sub-groups within the CLRP data based on similar patterns of parental class, educational attainment at index hospitalization, pre-morbid work history, premorbid social status, sex and race/ethnicity (Black *v.* White race). All analyses were conducted using PROC LCA in SAS 9.4 (Lanza, Collins, Lemmon, & Schafer, 2007). We compared multiple class solutions using standard information criteria (AIC and BIC) and normalized

entropy. After determining the optimal LCA solution, we used posterior probabilities to classify participants by group.

We next applied one-way ANOVAs with repeated measures with Bonferroni post-hoc corrections to examine the trajectory of work performance as measured by Strauss–Carpenter Work and financial independence as measured by the HFI of each latent class at the six follow-up evaluations over 20 years. We also conducted independent sample two-tailed *t* tests to examine potential differences between recruitment sites (Michael Reese Medical Center [MRMC] and the ISPI; online Supplementary Table S1).

Lastly, in order to refine our findings using ANOVA, we fitted generalized estimating equation (GEE) models on the latent groups from LCA in the presence of select clinical covariates that might contribute to differences in outcomes, including diagnosis, age at baseline, number of previous hospitalizations at baseline, psychosis status (active symptoms), and negative symptoms over time that are frequently reported and modeled in the psychosis outcomes literature as primary determinants of outcome. We chose the autoregressive within-subject covariance structure (‘working covariance’) AR(1) for the GEE analyses, by which the correlation between each timepoint decreases as a power of how many time points apart two observations are (Wang, 2014). *Our hypothesis was that classes with greater sociostructural disadvantage would fare worse on available work on financial status outcomes across all follow-ups. Conventional clinical variables (diagnosis and psychopathology) were included to test the hypothesis that even when such variables are modeled, sociostructural disadvantage negatively impacts outcomes.*

Results

Sample

Overall, the majority of the sample was White (71.5%, 183/256; remainder of the sample was Black), male (55%; 141/256), and diagnosed with a non-affective psychotic disorder (58%; 148/256).

In order to evaluate potential differences between those we excluded from further analysis ($n = 32$) due to attrition prior to follow-up, we calculated χ^2 or ANOVAs for each LCA variable and covariate. All variables with the exception of anxiety were non-significant; individuals with multiple follow-ups reported higher levels of baseline anxiety than those lost to follow-up (see online Supplementary Table S2).

We also examined differences between the MRMC and the ISPS recruitment sites. There were no significant differences between groups in sex, race, diagnosis, number of previous hospitalizations, premorbid social function, the presence of psychosis, anhedonia, depression, or anxiety at index, and the number of follow-ups with positive or negative symptoms. However, there was a significant difference between cohorts in premorbid work, age, years of education, and parental social class: MRMC participants were significantly younger, had better premorbid work function, higher level of education, and higher parent social class, compared to ISPI participants.

Description of the latent groups

LCA analysis

The variables included in the LCA analysis consisted of six variables at baseline: parental social class (1–5, the lower the better), patients’ race, sex, years of education, premorbid work, and premorbid social. A detailed description of these variables is found

in Table 1. To perform the LCA analysis, we converted years of education to a categorical variable: 1 = partial high or lower (≤ 11); 2 = high school (= 12); 3 = partial college (= 13, 14, or 15); 4 = college or higher (≥ 16). Since baseline sample size is under 300, we chose the optimal number of latent classes based on AIC and adjusted BIC, which suggested three classes.

The posterior probabilities of belonging to index categories for each LCA variable were calculated and are visualized in Fig. 1. For example, for parental social class (the top left plot in Fig. 1), the five categories from left to right are highest, high, medium, low, and lowest, represented by the colors green, blue, cyan, purple, and yellow, respectively. The length of each bar is determined by its respective probability. As illustrated in the figure, participants in LC1 are significantly more likely to have a highest (green) or high (blue) parental class categorization than LC2 or LC3, while participants in LC3 are more likely to have a lowest (yellow) or low (purple) parent social class categorization (purple). Similar conclusions can be drawn for the other variables. Notably, while some variables follow a linear pattern (e.g. LC1 has the highest parental SES, followed by LC2 and then LC3),

in other cases probabilities are non-linear; for example, premorbid work and social functioning are significantly stronger in LC2 *v.* both LC1 and LC3; and premorbid social functioning differs little between LC1 and LC3.

Overall, LC1 ('most advantaged') members are mostly White, have higher parental social class, higher levels of formal education prior to index hospitalization, and are more likely to be categorized as having a good work history. LC2 ('working class, some college') members are more likely to have moderate to low parental social class, but with substantially higher rates of college attendance (i.e. some college), slightly more likely to be White, more likely to have good premorbid work histories, and slightly more likely to be female. LC3 ('most disadvantaged') members are more likely to have low or very low parental social class, more likely to have low levels of formal education, slightly more likely to be White, more likely to have poor work histories, and more likely to be male. There was no significant distinction for premorbid social functioning.

As reported in Table 1, significant group differences were found for sex ($p = 0.003$), race ($p \leq 0.001$), premorbid work ($p \leq$

Table 1. Index demographic and descriptive table of latent class analysis variables and covariates for GEE models

		LC 1		LC 2		LC 3		<i>p</i> values
		<i>n</i> = 105		<i>n</i> = 73		<i>n</i> = 78		
Latent class analysis variables	Sex (male/female)	54/51		32/41		55/23		$\chi^2(2) = 11.8, p = 0.003$
	Race (White/Black)	104/0		37/36		42/36		$\chi^2(2) = 69.28, p \leq 0.001$
	Premorbid work (good/poor)	65/27		66/1		9/61		$\chi^2(2) = 111.56, p \leq 0.001$
	Premorbid social (good/fair/poor)	25/28/37		47/1/16		22/23/23		$\chi^2(4) = 42.04, p \leq 0.001$
		M	S.D.	M	S.D.	M	S.D.	<i>p</i> values
	Parent social class at baseline	1.88	0.96	3.71	0.95	4.00	1.14	$F(2, 223) = 105.2, p \leq 0.001$
Years of education at baseline	13.76	1.72	13.51	1.61	11.29	1.51	$F(2, 245) = 56.81, p \leq 0.001$	
Covariates for GEE models		<i>n</i>		<i>n</i>		<i>n</i>		
	Diagnosis at baseline (schizophrenia/AP)	57/48		36/37		55/23		$\chi^2(2) = 7.86, p = 0.02$
		M	S.D.	M	S.D.	M	S.D.	<i>p</i> values
	Age at baseline	22.47	3.26	22.92	3.88	22.08	3.01	$F(2, 253) = 1.17, p = 0.31$
	Number of prior hospitalizations at baseline	1.56	1.83	1.33	1.92	1.71	2.27	$F(2, 253) = 0.68, p = 0.51$
	Number of follow-ups with psychosis symptoms	1.95	1.86	2.66	1.86	1.76	1.74	$F(2, 241) = 4.88, p = 0.008$
	Number of follow-ups with negative symptoms	0.79	1.07	0.68	0.98	1.39	1.50	$F(2, 211) = 6.90, p < 0.001$
	Number of follow-ups with antipsychotic medication	1.95	1.94	1.81	2.05	2.35	2.12	$F(2, 252) = 1.48, p = 0.23$
Number of follow-ups without rehospitalization	2.72	2.09	2.85	1.88	2.28	1.89	$F(2, 253) = 1.79, p = 0.17$	
	M	S.D.	M	S.D.	M	S.D.	<i>p</i> values	
Baseline symptoms	Psychosis	2.33	1.73	2.48	1.89	2.67	1.65	$F(2, 234) = 0.78, p = 0.46$
	Anhedonia	1.53	0.86	1.46	0.85	1.32	0.73	$F(2, 232) = 1.39, p = 0.25$
	Depression	3.03	2.70	3.16	2.72	2.78	2.61	$F(2, 234) = 0.38, p = 0.68$
	Anxiety	1.51	0.88	1.42	0.82	1.39	0.80	$F(2, 234) = 0.49, p = 0.61$

Note: AP, affective psychosis; M, mean; SD, standard deviation.

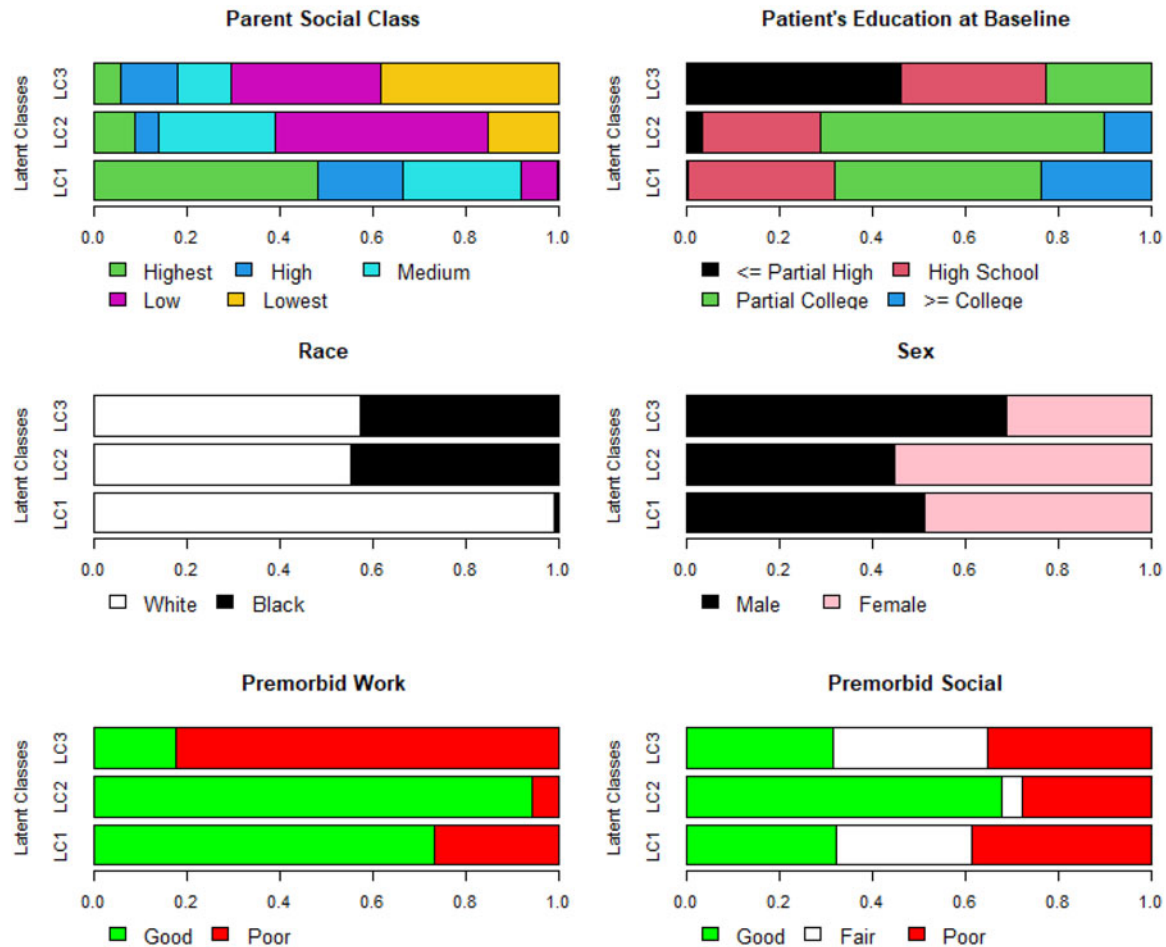


Figure 1. Posterior probabilities from LCA.

0.001), premorbid social ($p \leq 0.001$), parent social class ($p \leq 0.001$), and level of education at baseline ($p \leq 0.001$).

Table 1 also reports a set of covariates that have been associated with functional outcomes in prior studies, specifically baseline diagnosis, age, number of prior hospitalizations, and severity of psychosis symptoms, anhedonia, depression, and anxiety. There was a significant difference between groups in diagnosis at index hospitalization ($p = 0.02$), but no statistically significant differences in age ($p = 0.31$), prior hospitalizations ($p = 0.51$), psychosis ($p = 0.46$), anhedonia ($p = 0.25$), depression ($p = 0.68$), and anxiety ($p = 0.61$).

Hospitalizations and medication utilization

Lastly, we examined whether the latent class groups also varied in hospitalization and medication utilization, treatment factors that might partly explain vocational and financial outcomes, which showed non-significant differences for both hospitalization ($p = 0.17$) and antipsychotic utilization ($ps = 0.23$).

Table 2 details response variables. For example, for the SC work, LC2 score is a little better than LC1. Both LC1 and LC2

are significantly better than LC3. This pattern is consistent for all the seven response variables. That is, LC2 is the best, followed by LC1; LC3 is the worst. Note that in the LCA step, no response variables (working performance) are included. This further verified the hypothesis on the association between the latent groups and working performance.

Work-related outcomes across 20 years

Across the primary functional outcomes investigated, scores were higher for classes 1 and 2 at all time-points. Differences were most pronounced for Strauss–Carpenter work performance (SC-W; higher scores indicate a higher level of work function), with group 3 (LC3) faring worse at every follow-up (statistically significantly at all time-points; see Fig. 2). Figure 2 shows the trajectory of work performance across six follow-ups stratified by three latent classes ($ps \leq 0.001$ – 0.01). Bonferroni post-hoc analysis showed participants in LC3 had statistically significant decreased work performance at each subsequent follow-up evaluation compared to participants in LC1 ($ps \leq 0.001$ – 0.01) with the exception of the 10-year follow-up ($p = 0.06$) and at all evaluation time

Table 2. Summary statistics by latent classes for outcome measures over all time points

Outcome	Range	LC1 (n = 105)			LC2 (n = 73)			LC3 (n = 78)		
		n*	M	s.d.	n	M	s.d.	n	M	s.d.
SC work	0–4	410	2.26	1.68	300	2.50	1.64	323	1.34	1.56
Financial independence	1–5	338	3.26	1.74	238	2.85	1.80	290	3.98	1.48
Current employment status	1–5	347	3.32	1.82	251	3.05	1.88	293	4.15	1.48
Number of jobs in last year	1–5	344	2.93	1.71	250	2.80	1.72	289	3.78	1.60
Time unemployed in last year	1–5	346	3.13	1.79	251	3.08	1.79	294	4.06	1.49
Average employment score	0–5.5	343	3.16	1.61	252	2.91	1.64	294	3.95	1.40
Instrumental work performance	0–7.54	350	3.17	1.48	250	2.91	1.51	292	3.88	1.29

Note: The *p* values to measure class differences are all less than 0.0001.

*The *n* here is always larger than the class size because of multiple observations for the same patients at different follow-up time points.

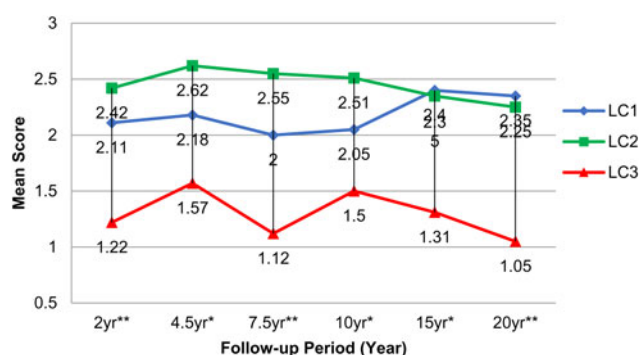


Figure 2. Strauss-Carpenter work six follow-ups over 20 years.

points when compared to participants in LC2 ($ps \leq 0.001-0.002$). Whereas participants in LC1 and LC2 were not statistically different at any follow-up evaluation ($ps = 0.10-0.88$) except for the 7.5-year follow-up ($p = 0.05$).

We also examined the trajectory of financial independence using the HFI by the three latent classes (lower scores indicate a higher level of financial independence) over the 20 years. Figure 3 shows the trajectory of financial independence across six follow-ups stratified by latent class ($ps \leq 0.001-0.02$). Bonferroni post-hoc analysis showed participants in LC3 compared to LC1 showed a statistically significant lower level of financial independence at the 2, 7.5, 10, and 15-year follow-up ($ps \leq 0.001-0.02$) but not the 4.5 or 20-year follow-up ($ps = 0.09-0.14$).

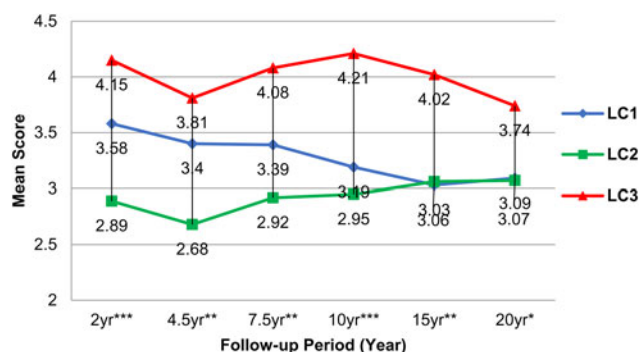


Figure 3. Financial independence six follow-ups over 20 years.

and at most evaluation time points when compared to participants in LC2 ($ps \leq 0.001-0.005$) except for the 20-year follow-up ($p = 0.10$). Whereas participants in LC1 and LC2 were statistically different at the 2 and 7.5- follow-up ($ps = 0.02-0.03$) but not at any of the subsequent follow-ups ($p = 0.14-0.95$).

GEE outcome for SC-work performance

Table 3 reports GEE model results for SC-work (1 = no work or less than half of the time; 2 = work at least half of the time), controlling for diagnosis, age at index hospitalization, prior hospitalizations, and presence of psychosis, negative symptoms, rehospitalizations over time, and medication status over time. The model is fitted for the probability of working at least half of the time. Negative coefficients in the estimate indicate lower probabilities of longer time work. For the convenience of reading, we listed all three pairwise comparison results between latent groups.

LC1 and LC2 do not differ in SC-work ($p = 0.73$), but LC3 was significantly less likely to work full-time than LC2 ($p = 0.0005$) and LC1 ($p = 0.0003$) across follow-ups. Turning to covariates, participants with a schizophrenia diagnosis were less likely to work full time than affective psychosis participants ($p < 0.0001$) as were participants with negative symptoms ($p = 0.03$). Age and prior hospitalization were non-significant.

GEE for the harrow functioning interview for work performance

GEE results for work performance are detailed in Table 4. LC3 participants experienced worse work performance than members of LC2 and LC1, across all component domains (work performance, number of jobs, time unemployed), again controlling for diagnosis, age, prior hospitalizations, active psychosis, and negative symptoms. LC3 participants also experience significantly less financial independence over time. LC1 members experienced lower financial independence and worse employment scores than LC2 but the groups did not significantly differ on other work performance domains. Diagnosis, age, active psychosis, and negative symptoms were also associated with financial independence and work performance over time.

Discussion

Using CLRP 20-year follow-up data, we found that latent intersectional social disadvantage (in place prior to psychosis onset) robustly predicted lower work functioning and reduced financial independence across time. The influence of social disadvantage

Table 3. GEE model results for SC work (binary outcome)

Empirical standard error estimates							
Parameter	Levels	Estimate	Standard error	95% Confidence limits		Z	Pr> Z
Intercept		1.91	0.33	1.27	2.56	5.81	<0.0001
Latent classes	1 v. 2	-0.19	0.30	-0.77	0.39	-0.65	0.5188
	3 v. 2	-1.21	0.29	-1.78	-0.64	-4.13	<0.0001
	3 v. 1	-1.02	0.26	-1.53	-0.50	-3.87	0.0001
Diagnosis	SZ	-0.68	0.24	-1.14	-0.21	-2.86	0.0042
	AP	0.00	0.00	0.00	0.00	.	.
Age group	20–25	0.30	0.29	-0.27	0.87	1.02	0.31
	≥ 26	0.16	0.37	-0.56	0.89	0.44	0.66
	≤ 19	0.00	0.00	0.00	0.00	.	.
Number of prior hospitalization	1 or 2	0.05	0.27	-0.48	0.58	0.20	0.84
	≥ 3	-0.05	0.30	-0.64	0.55	-0.15	0.88
	0	0.00	0.00	0.00	0.00	.	.
Active psychosis	Yes	-0.84	0.20	-1.24	-0.45	-4.17	<0.0001
	No	0.00	0.00	0.00	0.00	.	.
Negative symptoms	Yes	-0.22	0.20	-0.60	0.17	-1.10	0.27
	No	0.00	0.00	0.00	0.00	.	.
Medication	Yes	-0.65	0.22	-1.07	-0.22	-2.99	0.003
	No	0.00	0.00	0.00	0.00	.	.
Rehospitalization in last year	<6 Months of hosp.	-0.92	0.22	-1.35	-0.50	-4.24	<0.0001
	≥ 6 Months of hosp.	-3.55	0.81	-5.13	-1.97	-4.40	<0.0001
	No hospitalization	0.00	0.00	0.00	0.00	.	.

remained strong even when diagnosis (schizophrenia *v.* affective psychosis), active positive and negative symptoms, and hospitalizations prior to index were statistically controlled. Contrasts were strongest between the most disadvantaged class LC3 (what might be understood as aligned with the sociological construct of the ‘urban underclass’ [Marks, 1991], characterized by markedly lower parental social class and premorbid educational attainment) and both other classes (LC1 and LC2).

Differences between the two less disadvantaged classes (LC1 and LC2) were less pronounced and, contrary to our original hypothesis, some comparisons suggest that LC2 – the majority of whom had a working-class head of household in late adolescence, and had completed at least some college coursework prior to baseline, actually did better on indices of current work performance and financial independence than the universally White, highest SES class (LC1). As we expand on further below, we believe these converging and diverging outcome trajectories affirm the value of a latent class approach; affirm, that is, that our understanding of disparities and stratification is deepened through investigation of intersectionality as opposed to reliance on *a priori* state categories such as race or class in isolation (Monk, 2022).

LCA groups

A potential class paradox

While we hypothesized that higher SES groups would do better on study outcomes, the paradoxical finding that LC2 fared slightly

better than the all-White, highest SES LC1 is not in fact at odds with scholarship on class in the US. In the US healthcare system, for example, individuals who remain privately insured, whether because of trust funds or direct family financial support, are generally unable to access the sorts of intensive rehabilitative services provided in the public mental health system (Walker, Cummings, Hockenberry, & Druss, 2015). For some, ample family resources may also disincentivize employment or facilitate part-time (rather than full-time) careers or pursuits (e.g. in writing, music, and the arts) that would lead to lower scores on many of the Harrow work functioning metrics. Although available data do not allow for deeper unpacking (data on insurance status, family wealth, access to trust funds, etc., were not collected), these findings suggest that future research should aim to further elucidate the more nuanced ways in which vocational resilience may vary across individuals from working class, *v.* middle class and upper-middle class backgrounds.

‘Underclass’ v. working class and middle class participants

Researchers have long documented the multiple and complex ways in which welfare class or ‘underclass’ mobility is particularly socially and structurally constrained (Bjorklund & Breiger, 2020; Gottschalk, McLanahan, & Sandefur, 2019; Soss et al., 2011). Among many other factors, high childhood poverty (and its disproportionate, structurally enforced impacts on Black and Brown communities in the US) is associated with substantially higher rates of household member incarceration (Turney, 2018; Wildeman

Table 4. GEE results for the Harrow Functioning Interview work performance components

Parameter	Level	Financial independence	Work performance	Number of jobs	Time unemployed	Sum employment	Overall work
Intercept		2.55 ***	2.68 ***	2.36 ***	2.75 ***	2.67 ***	2.72 ***
Latent classes	1 v. 2	0.56*	0.26*	0.15	0.01	0.26	0.25
	3 v. 2	1.04 ***	0.77 **	0.82 ***	0.82 ***	0.85 ***	0.75 ***
	3 v. 1	0.48 *	0.51 *	0.67 **	0.81 ***	0.60 **	0.51 **
Diagnosis	SZ	0.44 *	0.58 **	0.35	0.55 **	0.55 **	0.39 *
	AP	0	0	0	0	0	0
Age group	20–25	–0.42*	–0.20	–0.33	–0.32	–0.37*	–0.43**
	≥ 26	–0.33	–0.19	–0.37	–0.39	–0.32	–0.39
	≤ 19	0	0	0	0	0	0
Number of prior hospitalization	1 or 2	–0.03	–0.03	0.15	0.01	–0.06	0.09
	≥ 3	0.18	0.25	0.49*	0.27	0.2564	0.36
	0	0	0	0	0	0	0
Active psychosis	Yes	0.56 ***	0.60 ***	0.62 ***	0.57 ***	0.46 ***	0.52 ***
	No	0	0	0	0	0	0
Negative symptoms	Yes	0.37 ***	0.30 *	0.37 **	0.24 *	0.28 **	0.29 **
	No	0	0	0	0	0	0

Note: * $p \leq 0.05$, >0.01 ; ** $p \leq 0.01$, >0.001 ; *** $p \leq 0.001$.

et al., 2018), chronic health and disability (Cockerham, Hamby, & Oates, 2017), and multi-generational dependence on multiple forms of welfare, including subsidized housing and public health insurance which may be lost if household incomes rise too much (Soss et al., 2011). Our findings arguably bear out a story in which while all individuals with psychotic disorders in the US are at risk of poor long-term outcomes relative to individuals without psychosis, these risks are not just higher, but markedly more pronounced among those who have already experienced multiple forms of significant sociostructural disadvantage in childhood. Education – and early disparities in educational access and support – also likely plays a role; for example, nearly half of LC3 members had not graduated from high school at the time of index hospitalization and only a small minority had attended college, with none graduating, in contrast to LC1 and LC2. These poor educational outcomes prior to index almost certainly reflect disadvantage rather than exclusively psychosis-related pre-morbid deficits (e.g. as per Bora, 2015), and likely also influence (and are reflected in) the markedly higher rates of poor (young adult) premorbid work functioning in this group. Undoubtedly unmeasured factors are also at play: for example, adverse childhood experiences, including neglect, housing instability, and food insecurity. The long-term outcomes of LC3, as elaborated further below, are also suggestive of the need for mental health services to more explicitly attend to the cumulative impacts of childhood adversity – and not solely through the psychological lens of trauma, but also as socio-environmental contexts that powerfully shape vocational and financial trajectories and outcomes.

Implications for research and practice

Embracing person-centered statistics

The QuantCrit movement has helped push quantitative researchers to engage more critically with measures, measurement, and analytics, acknowledging that ‘numbers are not neutral’, ‘categories are not natural or given’, and ‘both units and forms of analysis must be critically evaluated’ (Garcia, López, & Vélez, 2018). As QuantCrit scholars have argued *vis-à-vis* race, quantitative analytics can easily be used in ways that ultimately bolster what Zuberi (2001) describes as ‘pathological interpretations’ – interpretations, that is, that implicitly locate the problem in or with, for example, ‘Black race’ rather than the social conditions resulting in racial minoritization and inequality. Our analyses, which identify powerful impacts of intersectional disadvantage even when diagnosis, psychopathology, and medication use are statistically controlled, support a call to counterbalance the voluminous literature linking symptoms to outcomes, with greater attention to the sociostructural contexts which shape service users’ lives and outcomes.

Reconceptualizing premorbid functioning as an indication of social disadvantage v. primary neurobiological morbidity

The ‘pre-morbid functioning’ metrics used in the CLRP have been widely deployed in schizophrenia outcome studies. However, by convention, rather than indicators of disadvantage, these metrics tend to be operationalized as indices of ‘illness related cognitive decline before onset’ (Bora, 2015; cf Keefe, 2014; Fett,

Reichenberg, & Velthorst, 2022). In our conceptualization here we do not deny potential ways in which pre-morbid trajectories may also reflect ‘disease processes’ (and disease processes, of course, are also causally shaped by socioenvironmental adversity) but nevertheless assert that functional trajectories in adolescence and young adulthood cannot be separated from sociostructural context (Choo & Ferree, 2010; Cikara, Martinez, & Lewis, 2022; McAllister *et al.*, 2018). In practice, we thus suggest that premorbid functioning be shifted from its current operationalization as an indicator of ‘poor course of illness’ to an indicator of social and structural determinants whose ongoing impacts need to be proactively addressed.

Increasing attention to and measurement of both pre-morbid and ongoing sociostructural disadvantage in research

As noted in the introduction, in spite of broader calls to social and structural determinants of health, attention to measurement and modeling in the mental health services literature remains the exception rather than the rule (Cohen, 1993; Harper & Speed, 2012; Hopper, 2007; Karadzhov, 2023; Rose, 2014). Ferrari *et al.*'s (2023) recent scoping review of measures used in early intervention in psychosis programs affirms these concerns, with only a small minority of studies reviewed including any indicator of sociostructural disadvantage (primarily experiences of trauma). The majority of research includes only parent education and occupation as proxies of participant SES; no neighborhood-level indicators, financial hardship metrics, measures of racism, or other forms of discrimination (Braveman *et al.*, 2010; Williams & Mohammed, 2013a; Williams & Mohammed, 2013b). Even more proximal experiences, such as involuntary hospitalization, seclusion and restraint, court-ordered medication, and treatments, are unmeasured. Given the importance of these contexts and factors, attested to in the current study, even given significant limitations in the measures at our disposal, we strongly recommend that the mental health services research community prioritize measurement in these areas, including as part of funder mandates and common data measurement efforts.

Further, from a performance monitoring and quality improvement standpoint, we also argue that the greater predictive power of the LCA groups used in this study (in comparison to the single variables of race, parent class, and so on) provide proof of concept of the risks that over-reliance on single category measurement may mask disparities and social stratification in fact present in services. Once we identify such disparities, we are then poised to take further steps to identify and implement policy and practice changes designed to ameliorate them.

Foregrounding social and structural determinants in order to shift service priorities

As noted above, there are considerable risks of centering individual-level psychopathology (if and) when contexts and determinants at higher ecological levels (meso, macro) in fact play causal roles in shaping outcomes. When we can instead reframe presenting problems in terms of sociostructural contexts and determinants, we will be better positioned to imagine solutions truly responsive to these determinants. For example, instead of rapidly placing service users from disadvantaged backgrounds in low wage, contingent jobs, we might instead engage more deeply with the structural origins of such factors as low self-esteem, lack of education, and uneven early work history, working to overcome rather than reinforce stratification, for example, by plotting a potentially slower path to further education and a living wage (see Atterbury, 2021; Jones, Pagdon, Ebuenyi, Goldman, & Dixon,

2023). Similarly, if we identify sociostructural racism as the problem rather than ‘cultural differences’ warranting only ‘cultural adaptation’ or greater cultural competency among providers, we are more likely to take substantive action, i.e. addressing cumulative barriers in fact instigated by racist social, educational, and employment policies.

Limitations

The CLRP recruited a non-probability sample, rendering generalizability uncertain relative to first-episode epidemiological cohorts. Ideally, participants would have been enrolled at their first hospitalization; however, approximately one-quarter had multiple prior hospitalizations prior to study enrollment. Analysis of the CLRP data therefore cannot fully control for differences in intervals and experiences for participants who were ‘first-episode’ patients *v.* those who were not (although post-hoc analyses suggested no significant difference across the LCA groups reported in this paper). The sample analyzed includes only Black and White clients, reflecting the demographics of the hospitals at which participants were recruited but precluding any analysis of other major minoritized ethnoracial groups in the US. Finally, analyses made use of available data but key additional metrics related to class and structural disadvantage were unavailable, including insurance status, household income, and participant or family receipt of disability benefits (SSI/SSDI) or other specific forms of disability- or income-based welfare and the impacts of multigenerational disparities. Nevertheless, we believe our findings make an important and valuable contribution to a growing literature focused on the social and structural determinants of intervention effectiveness and functional course of disability.

Conclusions

Critics of the individualized approaches historically dominant in psychiatry and psychology allege that a narrowly ‘medical model’ approach to serious mental illness within academic psychiatry has led to the de-centering of social and structural determinants, prominently including social class, race, and their intersections (e.g. McCarty *et al.*, 2023; Metzl & Hansen, 2014; Metzl & Roberts, 2014). Our findings contribute to efforts to re-center the role of these determinants, finding enduring impacts of pre-morbid sociostructural disadvantage on long-term vocational functioning and financial (in)dependence. As mental health fields grow increasingly aware of health inequalities, findings such as these help make the case for intervention development and testing explicitly oriented toward mitigating underlying sociostructural sources of inequality, beyond illness-related deficits.

Supplementary material. The supplementary material for this article can be found at <https://doi.org/10.1017/S0033291724000588>.

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