Table S2: Initial Programme Theory Development and CMO Brainstorm

Creating initial brainstorming lists of 'contexts', 'mechanisms' and 'outcomes', without creating specific CMO configurations.

Material for this exercise was gathered from: youth advisory group workshop, workshop with researchers, initial scoping of literature, expert panel feedback, protocol reviewer comments, immersion of lead researcher in co-production literature.

CONTEXTS **Aspects beyond the programme with causal impact**	**MECHANISMS (explain how)** **Resources: within the programme** **Response: how these influence behaviour of participants.**	**OUTCOMES** **Result of a mechanism acting in a context (action)**
• type of healthcare setting • any existing participation structures in the organisation • social norms around hierarchy in the setting • Shared understanding of what co-production is • Inpatient mental health • community mental health • primary care • schools health programmes • general hospitals • social care • Compulsory treatment • Incarceration • False binary between service users/ EBE and staff. E.g. Peer support or EBE staff or staff who 'happen' to have lived experience (and disclose or do not) • Training routinely provided on co-production in the service • Staffing levels • Needs and individual circumstances of the	• Point at which young people are involved (e.g. outset) • Tokenism / service is self-congratulatory • Use of measures (validated / other) • Inclusion practices / cultural competence in the programme – adaptation of co-production process or environment for different learning styles, disabilities, interests, protected characteristics (response: experience of co-producing for the adolescents/other stakeholders) • The model of co-production used (EBCD, recovery colleges) • Tools/technologies of co-production used (e.g. practical activities, steering group) • Principles of co-production used • Participants were paid / renumerated • Age restrictions on participation • Training provided on co-production through the programme • Timing of the meetings • Protected staff time available • Funding for the programme • Space for meetings etc • Shared understanding of definitions (or conversely - disparate understandings) • Communication between meetings • Clear point of contact • Flexibility of facilitators (out of hours/ online meetings/ using email, allowing written responses rather than verbal etc) • Youth-led? • Mix of ages in the programme • Recruitment to the co-production (cherry picking / open invite / outreach) • Buy-in of participants • Power is shared	• services improve • new service designs emerge • positive or negative psychosocial impact of participation in a co-production initiative (and gains sustained over time) (co-production as a meaningful /therapeutic activity) • Who engages and who does not (Lack of diversity) • Compromise between principles and pragmatic approach/feasibility • Professionalisation / assimilation of YP (elite capture/deference politics) • Harm caused to participants • Outcomes for research and researchers (even if focus is service improvement) • Skills acquisition of participants • Ticks box for service but unsatisfying for service users

stakeholders (not all the same) • Different stakeholders views of project/programme success • Mental health lived experience of stakeholders • Power dynamics in the service • Philosophy/position/values of the service (e.g. is empowerment a priority?) • Power imbalance • Who are the end users? • Lived experience of participants (both service user and staff) • Skills in the team • Motivation of different stakeholders for participating • Long-term change within the service • Resistance (from status quo) • Geographical location • Literacy of participants • Mental health literacy of participants	• 'Professional' skills are required to participate (formal meetings with minutes, public speaking etc.) • What is being co-produced -taboo topics? • Process of managing expectations of stakeholders • Autonomy of stakeholders • Clear aims – what are you trying to achieve • Consideration of dignity • Process for managing power differences/hierarchy and responsibility • How risk / adverse events are managed • role clarity and balancing multi-disciplinary differences • Evaluation process • Buy in of different stakeholders • Funding • Space • Time (rushing/paced) • Food/snacks • Timelines • Support mechanisms in place • Transparency • Diversity and inclusivity • Accessibility considerations • Addressing power imbalance • Priorities being set • Consideration of psychological safety of young people / all • Follow up • Use of inclusive language/ knowledge accessibility/ audience/ user appropriate • Use of frameworks/models/standards of engagement • Consideration of whether co-production is appropriate prior to starting the project • Pastoral /psychological support available for participants • Recognition of contribution (e.g in publications / websites / events) • Participants 'age out' •	• Treatment in the service improves • Programme / participants are co-opted • Optimism / scepticism of participants at the end of the programme • Changed confidence of participants of participants at the end of the programme • Marginalised groups are included or excluded • measurable changes within a service • Resources 'age out' •

Developing a set of initial 'If…then' statements covering major areas of the programme's architecture (what is is about A that leads to B?) from the CMO brainstorm:

Keyword	Context	Mechanism (resource)	Outcome	Mechanism (response)
Topics avoided (e.g. risk)	A risk-averse culture in the mental health service	If the young people are only invited to co-produce on specific topics but others are avoided (e.g. risk management)	then they may leave the programme or give limited contributions.	Because they will not feel they have been included as equals and will lack trust in the sincerity of the programme.
Professionalisation	Norms of participation practices within the service.	If 'professional' skills are required to participate (e.g. attending formal meetings, public speaking, taking minutes)	then the programme will lack diversity.	Because a self-selecting group of stakeholders who are experienced with or interested in these activities will participate and those who prefer other communication or activity approaches will opt out.
Compulsory treatment	Treatment under the Mental Health Act (specifically: compulsory treatment/ incarceration in locked MH services)	If young people cannot opt out of treatment within the service	then co-production efforts in the environment will fail.	Because it will not be possible to facilitate equal power between participants (which is a core principle of co-production).
Co-optation, assimilation, elite capture, deference politics	The programme does not have the power to make meaningful changes within the service.	Stakeholders have different views of service improvement at outset.	Co-production 'works' for those who support status quo, not for those who seek change. (Service mostly unchanged, co-producers assimilate to support status quo).	Stakeholders adjust their expectations of change/compromise principles through a functionalist response (what can be done within the limits of this context?).
RIVAL THEORY Non-assimilation	The programme does not have the power to make meaningful changes within the service.	Stakeholders have different views of service improvement at outset.	Service users disengage or seek other routes to change outside of co-production. (e.g. psych abolition, campaigning, legal challenges)	The co-production programme is perceived by the users as tokenistic (and the service is perceived as self-congratulatory).

Co-production knowledge shared	Culture of participation in the organisation (shared understanding from existing structures/training)	Training on principles/model/framework of co-production provided		A shared understanding of co-production emerges
Inclusive practice / cultural competence	Organisational values of inclusion and how these are enacted day-to-day. ALSO Stakeholders' individual experiences/ circumstances/ views/ needs/ roles/ identities/ protected characteristics	If the facilitators utilise cultural competence and inclusion practices (e.g. consider timing of meetings, flexible to online/in-person, mindful of language use, pronouns, pacing content, trigger warnings, recruitment of programme participants, discuss racism/discrimination etc.)	Then, marginalised groups are better included and more likely to stay involved, consequently, the group participating is more 'representative' of the potential stakeholders.	Because the participants experience greater psychological safety and feel more welcome / included.
Time, space, money	Pressures on the service (e.g. staffing levels, performance targets, infrastructure/funding for the service overall)	If the programme is well-resourced (has funding, protected staff time/few staff vacancies, spaces to meet in, snacks!)	Then co-production is more successful (new designs emerge/service and treatment quality improves).	Because stakeholders feel valued and have the energy to engage.
Communication		If there is a clear point of contact and good communication about the programme between meetings		Because of a shared understanding and buy-in for the work.
Aims / evaluation	Service Philosophy/vision/values	If there are clear aims, transparency about the project scope and evaluation of the aims.		Because participants feel respected and have a shared understanding of success.
Planning	Service Philosophy/vision/values	If sufficient planning takes place to establish if co-production is appropriate, the project scope and managing risk.		Because stakeholders 'buy in' to the usefulness of co-production.
Addressing power imbalance	Hierarchy in the service	If power is explicitly discussed and there is a process in place for managing power differentials/hierarchy and responsibility within the group.	Then power is shared more equally amongst participants.	Because participants are aware of their relative power and a shared agreement to re-balance.

Youth-led	Co-production is feasible at the planning stage (not brought in once a project is identified)	If young people are involved from the outset of a co-production programme	Then the programme is more likely to truly reflect the needs and ideas of those with lived experience	Because young people shape the direction/priorities of the work, and identify the focus at the co-planning stages.
Service type	Type of mental health service (and therefore who are the end users)			
False dichotomy expert by experience/expert by training	Unspoken mental health lived experience of staff			
Recognition		If there is appropriate recognition of stakeholder contribution (financial, named author, speak at events, named on website, thanked at an event etc)	Then the programme has a positive psycho-social impact on participants.	Because stakeholders feel valued.
Psychological or pastoral support	Reflective practices/ structures of support in the organisation	If psychological or pastoral support is available for stakeholders	Then the programme has a positive psycho-social impact on participants.	Because of increased psychological safety and reduction of psychological harm.
Aging out / epistemic injustice	Global/local understanding of 'youth'	If there is an age restriction on participating.	Programme - Then the programme retains legitimacy (stakeholders have recent experience). participants – then young people will experience loss of role and change in identity as they 'age out'. products – then the products of the co-production project will logically also become less relevant over time as the contributors age and their experience which was contributed is less contemporary.	Because these stakeholders 'youth'/age is perceived by all stakeholders to give epistemic legitimacy to their participation/knowledge.

	Literacy and mental health literacy of stakeholders			
Product of co-production		What is being co-produced e.g.: • therapy/treatment itself • a service design/re-design • training materials for staff • patient leaflets • apps / websites • service environment • service evaluation		
Method of co-production		Tools/Techniques e.g.: • advisory group • peer support staff • community meetings • involved in staff recruitment/training		