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RESEARCH ARTICLE

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Longitudinal associations of loneliness and social isolation with care dependence among older adults in Latin America and China: A 10/66 dementia research group population-based cohort study

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Abstract

Objectives: With increasing life expectancy and rapid ageing, there is an expanding number of older people who have functional declines, greater needs for care and support and who are at increased risk of insufficient social interaction. Longitudinal investigations on the interplay between loneliness, social isolation and care dependence remain limited. This study thus aimed to investigate the longitudinal reciprocal association between social isolation/loneliness and care dependence among older adults in Latin America and China.

Methods: We analysed data from the population-based cohorts from the 10/66 Dementia Research Group (DRG) project (baseline 2003-07 and follow-up 2007–2010). The 10/66 DRG study recruited and followed up older adults aged 65 years or above in 11 catchment areas in Latin America and China. A total of 15,027 older adults from Latin America and China (mean age = 73.5, standard deviation = 6.5) were included in our analyses. Cross-lagged panel models were used to investigate potential reciprocal associations.

Results: Loneliness was positively associated with care dependence at baseline ($\beta = 0.11$, $p < 0.001$ in Latin America; $\beta = 0.16$, $p < 0.05$ in China]. Social isolation consistently had a stronger positive association with care dependence across all study sites in both waves. Longitudinally, care dependence positively predicted loneliness ($\beta = 0.10$, $p < 0.001$) and social isolation ($\beta = 0.05$, $p < 0.001$) in Latin American study sites but not in China. Yet there was no statistical evidence of lagged effects of loneliness and social isolation on care dependence in all study countries.

Conclusions: Older people with care dependence are at risk of developing loneliness and social isolation. It is crucial to develop complex care models using a societal approach to address social and care needs holistically, especially for the older group with declining functional capacity. Future longitudinal research is required to

explore the causal mechanisms of relationships and cultural differences, in order to inform the development of culturally appropriate care models.

KEYWORDS
care dependence, healthy ageing, Latin America and China, loneliness, social isolation

Key points

- Loneliness and social isolation were positively associated with care dependence among older people in Latin America and China.
- Longitudinally, care dependence predicted later experiences of loneliness and social isolation in Latin America but not in China.
- There is a need for embedding interventions for tackling loneliness and social isolation into health and care arrangements.
- Policy inputs to launching complex care models for addressing comprehensive social and care needs among older people with care dependence are essential for better achieving healthy ageing goals.

1 | INTRODUCTION

Loneliness and social isolation have been widely recognised as important public health issues with crucial implications for health systems. As the population ages rapidly worldwide, there are increasing concerns about loneliness and social isolation in the older age group, especially in those with greater health needs, who often face more barriers to accessing healthcare and social engagement.[1,2] Loneliness is a subjective feeling of dissatisfaction with social connections compared to desired social relationships.[3] In contrast, social isolation is an objective measure of limited or absent social connections,[4] providing a measure of problematic social relationships.[5] The two concepts capture some overlapping dimensions relevant to social interaction and connection, which are not always mutually dependent or co-existent. The former detects an individual's perceived deficits in social connection, whereas the latter provides a more direct assessment of actual social interactions.[6]

Loneliness and social isolation have emerged as recognised risk factors for poor physical and mental health, potentially leading to increased care dependence and worse morbidity across a range of conditions. There is a hypothesised biological pathway for associations between loneliness and morbidity: loneliness has a potential role in driving inflammation and weakening the immune system (e.g. higher levels of C-reactive protein and fibrinogen),[7] resulting in an increased risk of chronic illnesses in the long term. Substantial evidence has suggested the links between social isolation and adverse health outcomes, including functional difficulties,[8–10] heart disease, hypertension, obesity, anxiety, depression, cognitive impairment,[11] dementia[12] and premature death.[13] Cross-sectional and longitudinal findings from the 10/66 Dementia Research Group (DRG) study have reported that loneliness is more prevalent among those older people with physical impairments, care dependence, depression and dementia, and premature mortality in low- and middle-income countries (LMICs).[14]

Care dependence, a common issue and complication of multiple geriatric conditions and frailty, refers to lacking the capacity for independent living without or with little help from others in daily life.[15] As populations further age in LMICs, there is a sharp increase in the absolute number of older people who have care needs, namely those living with multiple chronic illnesses. Multimorbidity greatly increases the risk of long-term care dependence.[16–18] Previous studies have suggested potential bi-directional relationships between care dependence and both social isolation and loneliness. Older people with physical functional limitations are more likely to experience loneliness and social isolation.[9,19,20] This can be explained by socioeconomic, psychological and behavioural barriers to social interactions.[21] In addition, social isolation and loneliness in older age have also been linked to an increased rate of motor decline[8] and declining physical functional abilities.[9,10] They have also been found to be independent risk factors for progression of frailty[22,23] and increased needs for informal caregiving and the emotional and financial demands that are intrinsic to the role.[24]

To date, the causal mechanisms of health on loneliness and social isolation remain unclear,[25] with limited longitudinal evidence of both the course of care dependence and experiences of loneliness and social isolation. Previous evidence suggests that care dependence and loneliness/social isolation commonly co-exist. However, it remains unclear to what extent care dependence acts as a cause or consequence of loneliness and social isolation. It is crucial to understand bidirectional relationships between loneliness/social isolation and care dependence, particularly when it comes to the development of effective complex interventions to improve the social lives of older people as well as their physical and mental health. This study thus aimed to investigate longitudinal reciprocal associations between loneliness, social isolation and care dependence among older adults in China and Latin America using the10/66 DRG Cohort.

2 | MATERIALS AND METHODS

2.1 | Context and data resources

The study analysed data from population-based cohorts from the 10/66 DRG project. The baseline survey (2003-07) and follow-up survey (2007–2010) were conducted among older adults aged 65 years or above in 11 catchment areas across seven countries, including Cuba, Dominican Republic, Puerto Rico, Venezuela, Peru, Mexico and China.[26] Response rates for the baseline surveys were high across sites (72%–98%). Follow-up surveys traced and interviewed baseline participants, and those who died or whose non-responses had been visited at least three times visits were considered as loss to follow-up. In total, 15,027 participants were recruited at baseline, and 9948 participants were interviewed at follow-up. Information about older participants lacking capacity (e.g. due to dementia, mental health issues, frailty, etc.) was sought from key informants (co-residents and family members who are able to provide detailed information on older individuals' circumstances).[27] Informed consent was obtained from all participants. The 10/66 DRG study has obtained ethical approval from King's College London Research Ethics Committee and all local ethical committees.

2.2 | Measures

2.2.1 | Care dependence

In the 10/66 DRG study, we used a series of open-ended questions on living and care arrangements to assess the level of care needs. The interviewer coded care dependence based on the responses to the open-ended questions from the key informant of each participant, classifying responses according to whether participants required no care, needed care some of the time, or needed care much of the time. The responses were finally dichotomously coded as independence (0) and dependence (need much care, 1).[16,28] The same approach to measuring care dependence was used at the baseline and follow-up. This measurement has been validated in previous 10/66 DRG pilot and population-based epidemiological studies.[16,28,29]

2.2.2 | Loneliness and social isolation

Loneliness and social isolation were measured through self-report. Loneliness was assessed using a single-item measure, which has been adopted widely in previous research.[14,30] Based on the Geriatric Mental State-AGECAT package,[31] which consists of a single-item assessment on loneliness: 'Do you feel lonely?'. The response options include: not feeling lonely (0); mild to moderate intensity, infrequent or fleeting loneliness (1); and severe, frequent, or persistent loneliness (2). The measure of social isolation was adopted from the Berkman-Syme Social Network Index,[32] consisting of assessments on marital status, living arrangements, sociability (frequency of contacts with friends/relatives/neighbours), and social engagement. This approach has been validated and applied in previous research.[22,23] We created the social isolation index by capturing the following domains, with each item assigning one point: (a) being unmarried or not co-habit and living alone; (b) having less than monthly contact with (b1) children or relatives, (b2) friends, (b3) neighbours; and (c) not attending meetings of any community or social groups (clubs, lectures, or any social activities). Scores ranged from 0 to 5, with higher values indicating a higher level of social isolation.

2.3 | Statistical analyses

The cross-lagged panel models (Figure 1) were applied to investigate bidirectional associations between loneliness, social isolation and care dependence by providing occasion effects, lagged effects, and co-movements (bidirectional model): (a) Occasion effects capture the shared occasion-specific variance in variables (i.e. social isolation, loneliness and care dependence) at the same measurement occasion; (b) Stability paths estimate the persistence in social isolation, loneliness and care dependence over follow-up time; (c) Cross-lagged paths was applied to test the longitudinal bidirectional relationships. These models provide the temporal associations of loneliness and social isolation at baseline on follow-up care dependence; and the predictive effects of baseline care dependence on follow-up loneliness and social isolation; (d) co-movement paths estimate the correlations between social isolation/loneliness and care dependence at baseline and follow-up. All models were fitted separately for Latin America and China, adjusting for baseline age, sex, and education. Robust Weighted Least Squares (WLSMV) estimation was adopted in all analyses. Model fit was assessed by the Chi-square goodness-of-fit with p value > 0.05 suggesting good fit,[33] and the root mean square error of approximation (RMSEA),[34] with a value < 0.06 indicating good fit[35]; alongside using Comparative Fit Index (CFI)[36] and Tucker-Lewis Index (TLI),[37] with a value of 0.9 or above suggesting good fit. To further explore the direction of the relationship, in sensitivity analyses, we removed the non-significant cross-lagged pathway and fitted a unidirectional model to test the hypothesis that solely baseline care dependence predicts loneliness and social isolation at follow-up by accounting for care dependence at baseline. The unidirectional models were nested in bidirectional models, which were compared against bidirectional models using the Chi-square differences testing with the Satorra-Bentler Scaled Chi-Square formula.[38] All statistical analyses were performed by using STATA 16.0 (StatCorp LP) and Mplus 8.0 (Los Angeles, CA: Muthén & Muthén).

3 | RESULTS

A total of 15,027 older adults (mean age = 73.5, standard deviation (SD) = 6.5) from seven LMIC study sites were identified at baseline. The median length of follow-up ranged from 3.04 years (2.99–3.16) in

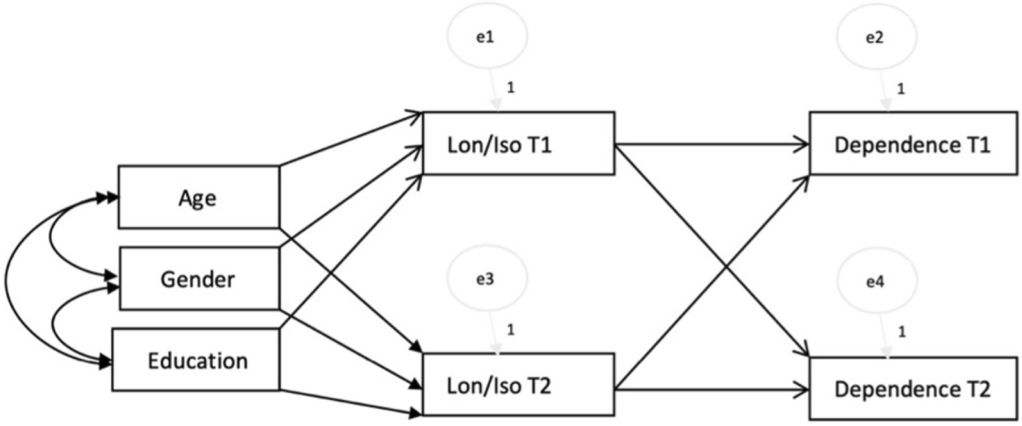

FIGURE 1 Cross-lagged model illustrating bidirectional associations between loneliness, social isolation and care dependence. Lon, loneliness; Iso, social isolation. *Models adjusted for baseline age, sex, and education. †T1: time 1; T2: time 2.

Mexico to 5.08 years (4.77–5.34) in China, with completion of follow-up interviews varying from 59.5% to 72.8% across sites. At baseline, 64.9% of the sample were female, and 40.5% did not complete primary school. Overall, 10.8% and 19.4% of the baseline and follow-up samples were care dependent, with the highest prevalence in Puerto Rico for both waves (14.4% & 22.9%). Across sites, the mean score of social isolation was 1.65 (SD = 1.10) at baseline and increased to 1.36 (SD = 0.96) at follow-up. 25.6% of the participants reported mild/severe loneliness at baseline, while 23.3% had loneliness at follow-up (Table 1).

3.1 | The concurrent and cross-lagged relationships between loneliness, social isolation and care dependence

All bidirectional models had good model fits, ranging from (CFI = 1.0, TLI = 0.9, RMSEA = 0.04) for the loneliness model to (CFI = 0.9, TLI = 0.9, RMSEA = 0.05) for the social isolation model in Latin America (Table S2). Concurrently, loneliness was positively associated with care dependence at baseline ($\beta = 0.11$, $p < 0.001$ in Latin America; $\beta = 0.16$, $p < 0.05$ in China) but not at follow-up. The positive concurrent associations between social isolation and care dependence were consistent for Latin America and China at both waves.

The autoregression effects of loneliness suggested moderate stability of loneliness ($\beta = 0.54$, $p < 0.001$ in Latin America; $\beta = 0.47$, $p < 0.001$ in China). Whilst there was slightly lower stability of social isolation across China and Latin American study sites ($\beta = 0.19$, $p < 0.001$ in Latin America; $\beta = 0.06$, $p < 0.05$ in China). The stability of care dependence was consistently high across all study sites. Net of autoregression occasion-specific effects and confounders, there were positive lagged effects of care dependence on loneliness ($\beta = 0.10$, $p < 0.001$) and social isolation ($\beta = 0.05$, $p < 0.001$) in Latin American study sites, but the lagged effects were statistically insignificant in China (Table 2). There was no statistical evidence of lagged effects in the opposite direction in all study countries. The fully adjusted cross-lagged panel models suggested a unidirectional relationship between loneliness, social isolation, and care dependence.

3.2 | Sensitivity analyses

We examined further the unidirectional relationship between baseline care dependence and follow-up loneliness and social isolation. Consistent with the main analyses, baseline care dependence positively predicted later experience of loneliness ($\beta = 0.09$, $p < 0.001$) and social isolation ($\beta = 0.05$, $p < 0.001$) in Latin America, but not in China (Table S1). All models with a good model fit, and difference chi-square tests were statistically non-significant, suggesting that unidirectional models fit the data as good as bidirectional models (Table S2).

4 | DISCUSSION

The study provides insights into the concurrent and longitudinal associations between loneliness, social isolation, and care dependence amongst older people in Latin America and China. Concurrently, feelings of loneliness and social isolation were positively associated with care dependence across study sites. Longitudinally, living with care dependence positively predicted loneliness and social isolation in Latin America but not in China. However, there was no statistical evidence of lagged effects of loneliness and social isolation on care dependence in all study countries.

Our findings suggested a unidirectional relationship between loneliness/social isolation and care dependence: care dependence predicted a higher likelihood of experiencing loneliness and social isolation among older people in Latin America. This is in line with the previous evidence that functional declines are associated with lower subjective well-being[39] and low autonomy in daily life,[40] and the group with functional declines are more vulnerable to deficits in

TABLE 1 Descriptive statistics for the study sample in the 10/66 DRG study.

Characteristics	Cuba	DR	Peru	Venezuela	Mexico	PR	China	Overall
Cohort at baseline	2944	2011	1933	1965	2003	2009	2162	15,027
Vital status ascertained	2635	1706	1752	1697	1844	1563	1991	13,188
Follow-up interview (% of baseline sample)	2007 (68.2%)	1197 (59.5%)	1311 (67.8%)	1257 (64.0%)	1459 (72.8%)	1265 (63.0%)	1452 (67.2%)	9948 (66.2%)
Median length of follow-up (years; IQR)	4.46 (3.92–5.20)	5.07 (4.93–5.22)	3.29 (2.78–3.73)	4.30 (4.09–4.79)	3.04 (2.99–3.16)	4.42 (4.12–4.83)	5.08 (4.77–5.34)	4.36 (3.48–5.02)
Baseline age mean (SD)	73.9 (6.4)	74.0 (6.8)	74.2 (7.0)	71.7 (6.3)	73.7 (6.3)	75.1 (6.5)	71.9 (5.4)	73.5 (6.5)
Gender (female)	1332 (66.4%)	829 (69.4%)	817 (62.3%)	817 (65.0%)	943 (64.6%)	869 (68.9%)	844 (58.1%)	6451 (64.9%)
Education								
Some primary and below	730 (24.9%)	1414 (71.0%)	352 (18.4%)	601 (31.2%)	1418 (70.9%)	461 (23.1%)	1078 (49.9%)	6054 (40.5%)
Complete primary	979 (33.3%)	370 (18.6%)	727 (37.9%)	965 (50.1%)	351 (17.5%)	415 (20.8%)	562 (26.0%)	4369 (29.3%)
Completed secondary or above	1227 (41.8%)	208 (10.4%)	838 (43.7%)	359 (18.7%)	232 (11.6%)	1123 (56.2%)	522 (24.1%)	4509 (30.2%)
Baseline								
Care dependence (*n*, %)	261 (10.1%)	237 (11.8%)	161 (8.3%)	209 (10.7%)	196 (9.8%)	288 (14.4%)	237 (11.0%)	1589 (10.8%)
Social isolation, mean (SD, range)	1.46 (0.99, 0–5)	1.51 (0.86, 0–5)	1.15 (1.15, 0–5)	1.29 (0.99, 0–5)	2.08 (1.09, 0–5)	1.77 (1.02, 0–5)	2.29 (1.13,0–5)	1.65 (1.10, 0–5)
Loneliness level (*n*, %)								
Lower (not lonely)	2139 (73.9%)	1362 (68.1%)	1323 (70.2%)	1463 (75.3%)	1297 (65.1%)	1341 (70.1%)	2040 (97.1%)	10,965 (74.4%)
Mild	734 (25.3%)	454 (22.7%)	470 (25.0%)	444 (22.8%)	637 (32.0%)	572 (29.9%)	56 (2.7%)	3367 (22.9%)
Severe	24 (0.8%)	184 (9.2%)	91 (4.8%)	37 (1.9%)	58 (2.9%)	1 (0.05%)	5 (0.2%)	400 (2.7%)
Follow-up								
Follow-up care dependence (*n*, %)	344 (17.3%)	302 (25.4%)	197 (15.1%)	260 (20.7%)	244 (16.7%)	284 (22.9%)	292 (20.1%)	1923 (19.4%)
Social isolation, mean (SD, range)	1.29 (0.90, 0–5)	1.27 (0.80, 0–4)	1.27 (1.11, 0–4)	1.11 (0.89, 0–5)	1.62 (0.91, 0–4)	1.26 (0.93, 0–4)	1.62 (1.00, 0–5)	1.36 (0.96, 0–5)
Loneliness (*n*, %)								
Lower (not lonely)	1612 (83.0%)	833 (70.5%)	958 (75.1%)	919 (74.7%)	956 (66.2%)	797 (68.2%)	1328 (94.3%)	7403 (76.7%)
Mild	326 (16.8%)	266 (22.5%)	305 (23.9%)	296 (24.1%)	460 (31.8%)	371 (31.7%)	76 (5.4%)	2100 (21.8%)
Severe	5 (0.3%)	83 (7.0%)	13 (1.0%)	16 (1.3%)	29 (2.0%)	1 (0.1%)	5 (0.4%)	152 (1.6%)

Abbreviations: DR, Dominican Republic; PR, Puerto Rico; SD, standard deviation.

social relationships.[9,19,20] Older people burdened by care dependency are particularly disadvantaged in social participation. Care dependence may lead to a reduction in social interactions if no additional support is in place, potentially triggering experiences of loneliness or social isolation. Through socioeconomic pathways, the remaining social inequalities in care dependence could also exacerbate household financial burdens derived from being dependent/providing family caregiving.[41] As deprived older people are at greater risk of experiencing loneliness and social isolation,[4] the accumulated burdens of addressing care dependence seem to shape a vicious circle of declining health status and unmet social needs over time. From a long-term perspective, there could inform a potential negative loop of health inequity and social deficits that consistently burden family and social protection systems.

TABLE 2 Cross-lagged modelling for associations between loneliness, social isolation and care dependence.

	Loneliness			Social isolation		
Bidirectional model		**β[b]**	**S.E.**		**β[b]**	**S.E.**
Latin America						
Autoregression	LO T1→LO T2[a]	0.54***	0.01	SI T1→SI T2	0.19***	0.01
	CD→T1 CD T2	0.79***	0.02	CD T1→CD T2	0.79***	0.02
Cross-lagged	CD T1→LO T2	0.10***	0.02	CD T1→SI T2	0.05***	0.01
	LO T1→CD T2	0.03	0.02	SI T1→CD T2	0.00	0.02
Baseline correlations	CD T1↔LO T1	0.11***	0.02	CD T1↔SI T1	0.23***	0.01
Follow-up correlations	CD T2↔LO T2	0.06	0.04	CD T2↔SI T2	0.27***	0.02
China						
Autoregression	LO T1→LO T2	0.47***	0.11	SI T1→SI T2	0.06*	0.03
	CD T1→CD T2	0.79***	0.05	CD T1→CD T2	0.85***	0.05
Cross-lagged	CD T1→LO T2	0.13	0.10	CD T1→SI T2	0.02	0.04
	LO T1→CD T2	0.16	0.11	SI T1→CD T2	−0.04	0.05
Baseline correlations	CD T1↔LO T1	0.16*	0.08	CD T1↔SI T1	0.36***	0.03
Follow-up correlations	CD T2↔LO T2	0.04	0.18	CD T2↔SI T2	0.42***	0.06

Abbreviations: CD, care dependence; LO, loneliness; SI, social isolation.

[a]T1 = time 1; T2 = time 2.

[b]β = standardised coefficient; single-headed arrows represent regression effects; double headed arrows represent correlations; all models adjusted for baseline age, sex, and education.

*$p < 0.05$; ***$p < 0.001$.

We found geographical variation in the lagged effects of care dependence on loneliness and social isolation, with no evidence of an association in China. This inconsistency may be attributable to the lower prevalence of loneliness in China compared to other 10/66 DRG study sites using a single-item measurement in the 10/66 DRG.[14] The differences may be due to cultural variances in the concept of loneliness; therein, stigma and shame for reporting loneliness and social isolation may also play a role in participants' responses. Another potential explanation is the cultural variations in home caring, for instance, the cultural norm of filial piety in China, where familial caregiving and support play crucial roles in care provisions.[42] In this study, the care dependence cases were sought from key informants, therefore identifying a group with higher care needs who already secured accompany/support from family members or caregivers. With principles of filial piety being held to and thus the group were less likely to report/feel loneliness and social isolation. In the context of familial caregiving culture, the Chinese group with care dependence may receive more family support compared to other cultures, which could partially explain absent lagged effects. However, previous 10/66 DRG qualitative evidence from China has pointed out problematic healthcare navigation in older age as health and social systems heavily rely upon family support (especially the adult children), which has been perceived as unreliable and unsustainable by those older people who reported having unmet health and social needs (Gao et al. in preparation). This also echoes previous 10/66 DRG quantitative findings that even though loneliness was less prevalent in China, the effect of loneliness on mortality risk remained stronger than that in Latin American countries. Future qualitative and experimental research is needed to understand if the low prevalence of loneliness is a measurement issue and explore the changing and increasingly contested social norms, care/support of older people and loneliness and the underlying socioeconomic, psychological, and behavioural barriers related to social interactions among those older people with care needs in different cultures.

For the opposite path, there was no statistical evidence of a lagged effect of loneliness/social isolation on care dependence in the present study. One potential explanation is that our measure of care dependence captures a more vulnerable group with poorer health conditions. Therefore, the hypothesised lagged effects of loneliness/social isolation may be attenuated by health-related factors. The hazardous effects of loneliness/social isolation in care dependence could be accumulated in the long term through biopsychosocial and behavioural pathways.[43] Further studies may need to explore the effects of loneliness/social isolation on the trajectory of care dependence, whilst qualitative work may be needed to understand the underpinning causal mechanisms.

The hypothesised positive concurrent relationships between loneliness/social isolation and care dependence were supported by our findings in Latin America and China, suggesting that loneliness and social isolation are more concentrated amongst older groups with care needs. This aligns with previous findings from Latin American and other European countries. The lonely or socially isolated group are at greater risk of having motor declines,[8] declining physical functional abilities,[9,10] dementia, multiple chronic illnesses[14]

and frailty,[22,23] resulting in increased care demands. Lacking social interactions (incorporating loneliness and social isolation) may also have harmful effects on developing protective health-seeking behaviour,[44] which may hinder long-term disease management. As a result, loneliness and social isolation could directly worsen health status and indirectly increase the risk of physical functional capacity declines. Moreover, given prior evidence, promoting social participation has been suggested as an intervention to curb the risk of functional disability onset.[45,46] This echoes previous evidence of the effectiveness of delivering systematic non-clinical interventions for social needs (e.g. social prescribing) in improving mental well-being and reducing secondary healthcare demands.[47] Thus, loneliness and social isolation are modifiable risk factors and interventions to address them have the potential to improve health conditions and disease management. Concomitantly, there is a need to integrate support for mental well-being (including tackling loneliness and social isolation) into care packages, especially for those who face more barriers to social connection and interaction due to declining physical functional abilities.

Our study did not demonstrate a clear distinction between the effects of loneliness and social isolation. However, compared to loneliness, social isolation has a strong concurrent association with care dependence and slightly lower stability across all study sites. It suggested the potential difficulty to shift once older people become lonely; in contrast, social isolation is a more modifiable risk factor, which could also interplay with loneliness when influencing functional capacity. Older people with care dependence may have more barriers to getting satisfactory social connections and participation. As a result, individuals may seek additional care services from health professionals and caregivers to meet social needs, such as alleviating feelings of loneliness and social isolation.[48] Thus, it is important to develop health promotion interventions to alleviate barriers to social engagement and interactions of older people with care dependence.

One strength of the study is to provide a first cross-cultural understanding of the longitudinal associations between loneliness, social isolation and care dependence in Latin America and China. The care dependence measure applied in the 10/66 DRG study provided a validated and robust measure of needs for care, which is rarely available in cross-cultural population-based studies. However, limitations remain in the study. First, there is uncertainty related to the culture variances in current loneliness/social isolation measurement. Although the reliability and consistency in using a single-item measure across cultures have been documented,[49] adopting different measurement approaches (e.g. multiple-items, direct or indirect single-item measure) could capture a different lonely group.[50,51] Meanwhile, the various ingredients which make up the overall social isolation measure may have different weights across cultures. Thus, the measure used may influence the estimated relationships differently across countries. We ran the model for Latin American study sites as a whole sample, which may introduce some bias. It is necessary to validate existing instruments for assessing loneliness and social isolation in health and social care settings that can better capture older people's experiences of social deficits across different cultures in future studies. Second, the models only adjusted for key sociodemographic confounders at baseline, and we cannot rule out the possibility of overestimations in current findings. The level of care dependency, loneliness and social isolation are fluctuating constructs and vary over time. The potential health confounders may also vary over time and could intensify or attenuate the potential relationships between loneliness/social isolation and care dependence. Uncaptured changes during the follow-up period may introduce bias in our estimates. The lost to follow-up in population-based cohort studies may also lead to selection bias in the estimates. Using cross-lagged modelling is beneficial for attempting to explore the reciprocal relationships between experiencing loneliness, social isolation and care dependence. The current estimates were based on two-wave of data only, we therefore cannot rule out potential bidirectional associations. Associations are insufficient to indicate causality. Future longitudinal studies are needed to support the understanding of the causal mechanisms of interplay between problematic social relationships and care dependency in different cultures.

5 | CONCLUSIONS

The study provides evidence for the concurrent associations between loneliness, social isolation and care dependence in Latin America and China. The findings suggest that care dependence predicted a subsequent experience of loneliness and social isolation among older people in Latin America but not in China. This provides fundamental evidence for supporting further interventional programmes and policy advocacy in better achieving healthy ageing goals amongst older people with care needs in LMICs. Older populations with care dependence are likely to experience loneliness and social isolation. The lagged effects of care dependence on loneliness and social isolation could further worsen disease progression and trigger additional care needs. Future longitudinal research is required to explore the causal mechanisms of relationships and cultural differences. It is possible that emotional support from family and caregivers may alleviate feelings of loneliness and social isolation, which could potentially explain absent lagged relationships in China, but this needs more qualitative and experimental investigation in future. The findings also highlight the importance of integrating the management of social deficits into wellbeing programmes, especially among those with care dependence.[15] As societies age and life expectancies extend in Latin America and China, it is crucial to use a systematic approach to design and evaluate complex care interventions that integrate these crucial social promotion elements.

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CONFLICT OF INTEREST STATEMENT

The authors declare no competing interests.

DATA AVAILABILITY STATEMENT

Data are obtained available at the 10/66 Dementia Research Group with monitored public access.

ETHICS STATEMENT

The 10/66 Dementia Research Group study has obtained ethical approvals from Kings College London ethical committee and local ethical committees in each study site.

PATIENT CONSENT STATEMENT

Informed consent was sought and acquired from all participants.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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