

## VISUOMENĖS SVEIKATA

### Psychometric properties of the World Health Organization Quality of Life 100 questionnaire in the middle-aged Lithuanian population of Kaunas city

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**Key words:** quality of life; WHOQOL-100; validity; reliability.

**Summary.** This study aimed to identify psychometric properties of the World Health Organization Quality of Life 100 questionnaire.

**Material and methods.** A random sample of 1403 Kaunas city men and women aged 35–64 years was examined in 2001–2002. Quality of life was assessed by the self-administered World Health Organization Quality of Life 100 questionnaire.

**Statistics.** Scores of all domains and facets of the questionnaire were transformed to reflect a scale from 0 to 100. The validity and reliability of the questionnaire were evaluated by Pearson's correlation coefficients and by Cronbach's  $\alpha$ . The relationship between the WHOQOL-100 domains and the two general items (G1 and G4) was assessed using linear regression analysis. Exploratory factor analysis was conducted to explore the factor structure of the data.

**Results.** The mean scores of the World Health Organization Quality of Life 100 questionnaire domains ranged from  $51.3 \pm 15.1$  (overall quality of life) to  $72.0 \pm 16.4$  (level of independence domain). The instrument displayed acceptable Cronbach's  $\alpha$  (0.77–0.91) and test-retest reliability (0.64–0.89). The overall assessment of quality of life (G1) was most strongly associated with the environment ( $\beta=0.31$ ), psychological ( $\beta=0.18$ ), and social relationships ( $\beta=0.17$ ) domains. Overall health (G4) showed the strongest association with the level of independence ( $\beta=0.34$ ) and physical ( $\beta=0.18$ ) domains. The principal component analysis revealed five-factor solution, which accounted for 57.7% of a total variance.

**Conclusion.** In the Lithuanian population, the World Health Organization Quality of Life 100 questionnaire was found to be a suitable instrument for evaluating quality of life.

#### Introduction

Quality of life (QOL) means a good and successful life and is the same as living a life with a high quality. The notion of a good life can be observed from subjective to the objective, where this spectrum incorporates a number of existing QOL theories (1).

QOL and individual's perception of his/ her own health has become the subject of the great interest in Lithuania. One of the main reasons is the finding that it predicts subsequent mortality, as well as functional decline and even subsequent chronic disease. Health care planners are recognizing that measures of disease alone are insufficient determinants of health status (2). Over the past decades, two classes of complementary health status measures have emerged to fill the information gap – objective measures of functional health

status and subjective measures of health and well-being (3). These measures are multilevel and multidimensional. There are many QOL measures but there is still a lack of consensus among researchers about its definition, and this is reflected in the choice of items for their instruments (2). Quality of life has been defined by the World Health Organization (WHO) as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns (4). It is a broad-ranging concept incorporating in a complex way the person's physical health, psychological state, level of independence, social relationships, personal beliefs, and their relationship to salient features of the environment. WHO initiative to develop a QOL assessment instrument,

WHOQOL-100, arises from a need for a genuinely international measure of QOL and restates its commitment to the continued promotion of a holistic approach to health and health care (4). The WHOQOL-100 is organized into six broad domains: physical, psychological, level of independence, social relationships, environment, spiritual and the overall QOL and general health. It is anticipated that the WHOQOL-100 will be used in a broad-ranging ways, such as use in the epidemiological research, clinical trials, clinical practice, health policy research, and health and social service audits (4). The WHOQOL project is the part of a larger goal toward "Health for All" and the promotion of physical, psychological, and social well-being.

Self-assessments of health-related QOL are being used for a number of purposes, including population monitoring and clinical studies. Normative data from the general population make it possible to interpret the QOL scores for an individual respondent or a group mean by comparing them with the distribution of scores within that population (4).

In Lithuania, there is a lack of information about the public's perception of the quality of life. In Lithuania, health-related QOL studies more and more often are performed in the specific patient groups, but still there is a lack of such population-based research (5, 6). Few previous studies examined gender differences in QOL ratings and the impact of aging on the QOL in general population of Kaunas (7, 8).

The integral part of the QOL analysis and interpretation is to evaluate validity and reliability of the questionnaire. Psychometric standards of the QOL measure instruments WHOQOL-100 and its abbreviated version WHOQOL-BREF also were confirmed only in few previous studies in Lithuania (9–11).

The aim of this study was to evaluate psychometric properties of the WHOQOL-100 questionnaire in the middle-aged Lithuanian urban population.

### Material and methods

A representative random sample of 1403 Kaunas city (Lithuania) men and women aged 35–64 years and stratified by age and sex was examined in 2001–2002 (625 men and 778 women; the response rate was 62.4%). QOL was assessed by the self-administered WHOQOL-100 questionnaire. QOL assessment was the part of health survey, which also included health examination and face-to-face interview. A total of 1347 of examined persons filled out the WHOQOL-100 questionnaire. Data of 1296 persons (570 men and 726 women) were confirmed for statistical analyses. Approval from the regional Ethics Committee of

Kaunas University of Medicine was obtained, and participants signed a written informed consent before the examination. The original English-language version of the WHOQOL-100 questionnaire first was translated into Lithuanian then translated back into English to test the adequacy of the first translation. Cultural adaptation of the QOL instrument was performed after the pilot study of 45 randomly selected persons.

The WHOQOL-100 is organized into the six domains: the overall QOL, physical, psychological, level of independence, social relationships, environmental and spirituality domains. Within each domain, a series of subdomains (facets) of QOL summarize that particular domain of QOL.

### Statistical analysis

Scores of all domains and facets of the WHOQOL-100 were transformed to reflect a scale from 0 to 100, with higher scores denoting better QOL (12). The validity and reliability were evaluated by Pearson's correlation coefficients and by Cronbach's  $\alpha$ . To test the intra-individual reliability of the WHOQOL-100, 72 patients were randomly selected to complete the same questionnaires 2 weeks after they first had completed questionnaires. For assessing test-retest reliability, intraclass correlation coefficients (ICCs) were calculated. Multitrait analysis was used to assess the construct validity of the scales. Correlation was considered weak, moderate, or strong when Pearson correlation coefficients were  $\leq 0.3$ ,  $0.3-0.7$ , or  $\geq 0.7$ , respectively (13). The relationship between the WHOQOL-100 domains and the two general items (G1, "How would you rate your quality of life?" and G4, "How satisfied are you with your health?") was assessed using linear regression analysis. Exploratory factor analysis with orthogonal varimax rotation was conducted to explore the factor structure of the data. Eigenvalues and directions of factor loadings explaining variance and communalities were analyzed. Data were analyzed using the statistical package SPSS, version 10.0.

### Results

Table 1 presents descriptive statistics of six WHOQOL-100 domains and overall QOL. Descriptive statistics included the mean, median, range, standard deviation, skewness, kurtosis, and the percent scoring at the lowest possible value (floor) and the highest possible value (ceiling). The mean scores for the WHOQOL-100 domains ranged from  $51.3 \pm 15.1$  (overall QOL) to  $72.0 \pm 16.4$  (level of independence

**Table 1. Descriptive statistics for the WHOQOL-100 domains**

The WHOQOL-100 domains	No. of items	Mean	Median	Range	SD	Skewness	Kurtosis	Floor (%)	Ceiling (%)
Overall QOL	4	51.3	50.0	93.8	15.1	-0.29	0.29	0.4	0.0
Physical	12	59.4	60.4	83.3	13.7	-0.41	0.14	0.0	0.0
Psychological	20	58.4	58.8	73.8	11.3	-0.25	0.12	0.0	0.0
Level of independence	16	72.0	75.0	98.4	16.4	-0.99	0.97	0.0	0.2
Social relationships	12	60.6	62.5	79.2	13.7	-0.38	-0.17	0.0	0.0
Environment	32	54.6	54.8	73.8	10.8	-0.18	0.16	0.0	0.0
Spirituality	4	54.2	56.3	100.0	17.3	-0.21	0.11	0.3	0.7

SD – standard deviation.

**Table 2. Validity and reliability of the WHOQOL-100**

The WHOQOL-100 domains	Convergent validity*	Divergent validity**	Cronbach's $\alpha$	Test-retest reliability (ICC)
Overall QOL	0.45	0.23	0.77	0.74
Physical	0.30	0.16	0.84	0.86
Psychological	0.27	0.18	0.88	0.68
Level of independence	0.41	0.18	0.91	0.89
Social relationships	0.28	0.17	0.82	0.76
Environment	0.20	0.15	0.89	0.79
Spirituality	0.56	0.18	0.83	0.64

\*Mean of Pearson correlations between items in their own domains.

\*\*Mean of Pearson correlations between items and domains other than their own.

ICC – intraclass correlation coefficient.

domain). The WHOQOL-100 domains were found to be negatively skewed. Floor and ceiling effects were 0% or minimal for all WHOQOL-100 domains.

Table 2 shows the level of internal consistency and construct validity (convergent and divergent) of the questionnaire. Cronbach's  $\alpha$  for each domain and overall QOL exceeded 0.77. Test-retest reliability was moderate to high for the WHOQOL-100 domains (0.64–0.89). The correlations between items inside the designated domain (convergent validity) were generally stronger, and the correlations between items outside the parent domain (divergent validity) were weaker.

Table 3 gives the results of the multitrait analysis showing correlations between the facets of the WHOQOL-100 and its six domains. As it was expected, all the facets had their strongest correlations with the domains to which they had been assigned. The energy and fatigue facet (physical domain) was also strongly correlated with the level of independence domain ( $r=0.71$ ). All the facets related to the level of independence domain correlated moderately with the physical domain ( $r=0.52$ – $0.63$ ). Moderate correlations were

also found between energy and fatigue facet (physical domain,  $r=0.59$ ), activities of daily living facet (level of independence domain,  $r=0.58$ ), personal relationship facet (social relationships domain,  $r=0.59$ ), recreation and leisure facet (environment domain,  $r=0.56$ ), spirituality facet ( $r=0.51$ ) and psychological domain. Positive feelings facet (psychological domain) correlated moderately with the social relationships domain ( $r=0.55$ ) but was even more strongly correlated with the spirituality domain ( $r=0.57$ ).

To establish WHOQOL-100 construct validity, domain scores were compared to general single-item QOL and health measures (items G1 and G4, Table 4). Proportion of variation that was explained by the linear regression model was 43% for general QOL assessment (dependent variable G1) and 36% for general health assessment (dependent variable G4). The overall assessment of QOL was most strongly associated with the environment ( $\beta=0.31$ ), psychological ( $\beta=0.18$ ) and social relationships ( $\beta=0.17$ ) domains, whereas the impact of level of independence domain on the overall QOL was not statistically significant. Overall health showed the strongest asso-

**Table 3. Correlations between the facets and domains of the WHOQOL-100**

The WHOQOL-100 domains and facets	PH	PS	LI	SR	ENV	SP
Physical domain (PH):						
1. Pain and discomfort	<b>0.70</b>	0.31	0.46	0.19	0.23	0.01
2. Energy and fatigue	<b>0.77</b>	0.59**	0.71*	0.39	0.43	0.31
3. Sleep and rest	<b>0.79</b>	0.37	0.40	0.24	0.24	0.20
Psychological domain (PS):						
4. Positive feelings	0.29	<b>0.69</b>	0.38	0.55**	0.53**	0.57**
5. Thinking, learning, memory and concentration	0.37	<b>0.71</b>	0.41	0.43	0.45	0.42
6. Self-esteem	0.34	<b>0.78</b>	0.40	0.43	0.45	0.45
7. Body image and appearance	0.34	<b>0.70</b>	0.38	0.32	0.32	0.24
8. Negative feelings	0.57**	<b>0.67</b>	0.45	0.35	0.35	0.17
Level of independence (LI):						
9. Mobility	0.52**	0.44	<b>0.77</b>	0.31	0.32	0.24
10. Activities of daily living	0.63**	0.58**	<b>0.83</b>	0.39	0.43	0.30
11. Dependence on medication or treatments	0.52**	0.33	<b>0.80</b>	0.24	0.24	0.18
12. Working capacity	0.53**	0.54**	<b>0.83</b>	0.38	0.44	0.40
Social relationships (SR):						
13. Personal relationships	0.35	0.59**	0.37	<b>0.80</b>	0.54**	0.37
14. Social support	0.20	0.36	0.23	<b>0.76</b>	0.53**	0.36
15. Sexual activity	0.31	0.44	0.35	<b>0.79</b>	0.41	0.27
Environment (ENV):						
16. Physical safety and security	0.31	0.38	0.27	0.36	<b>0.59</b>	0.20
17. Home environment	0.18	0.33	0.18	0.36	<b>0.65</b>	0.25
18. Financial resources	0.24	0.36	0.26	0.37	<b>0.65</b>	0.23
19. Health and social care: accessibility and quality	0.21	0.31	0.21	0.39	<b>0.63</b>	0.31
20. Opportunities for acquiring new information and skills	0.27	0.46	0.37	0.49	<b>0.71</b>	0.40
21. Participation in and opportunities for recreation and leisure	0.33	0.56**	0.41	0.56**	<b>0.69</b>	0.44
22. Physical environment (pollution/noise/traffic/climate)	0.26	0.25	0.22	0.29	<b>0.55</b>	0.15
23. Transport	0.23	0.28	0.26	0.35	<b>0.64</b>	0.22
Spirituality/religion/personal beliefs (SP)	0.25	0.51**	0.33	0.43	0.44	<b>1</b>

\*The facet correlations  $\geq 0.7$  with the other WHOQOL-100 domains.

\*\*The facet correlations  $\geq 0.5$ – $0.7$  with the other WHOQOL-100 domains.

**Table 4. Construct validity of the WHOQOL-100: association of the domains with the general items G1 and G4 (linear regression)**

Dependent variables (general items G1, G4)	Predictors (WHOQOL-100 domains)	Standardized coefficients ( $\beta$ )	<i>P</i>
Overall QOL (G1)  <i>R</i> =0.65, <i>R</i> <sup>2</sup> =0.43	Environment	0.31	0.0001
	Psychological	0.18	0.0001
	Social relationships	0.17	0.0001
	Physical	0.08	0.003
	Spirituality	0.07	0.004
Health (G4)  <i>R</i> =0.60, <i>R</i> <sup>2</sup> =0.36	Level of independence	0.34	0.0001
	Physical	0.18	0.0001
	Psychological	0.12	0.0001
	Environment	0.06	0.036



ciation with the level of independence ( $\beta=0.34$ ) and physical ( $\beta=0.18$ ) domains as predicted.

The Kaiser-Meyer-Olkin (KMO) resulted in a measure of sampling adequacy of 0.93, and the Bartlett's test of sphericity ( $\chi^2=11912.3$ ,  $df=276$ ,  $P<0.0001$ ) indicated the appropriateness to proceed with factor analysis. The Kaiser rule (eigenvalue greater than one) was used to determine the number of factors to be indicated. We used the varimax method to obtain orthogonal factors. Using this method, a five-factor solution was indicated. Using varimax rotation method, each factor tends to have either large or small loadings of any particular variable. A varimax solution yields results that make it as easy as possible to identify each variable with a single factor. Direct oblimin rotation is a nonorthogonal solution method that is one, in which factors are allowed to be correlated. This can result in higher eigenvalues but diminished interpretability of the factors (14). In our case, the purpose of the factor analysis was to explore the factor structure of the WHOQOL-100 without any prior suggestion how many factors there are or whether they are correlated. To ensure no meaningful solution was overlooked, four-, five-, and six-factor solutions were also rotated using the orthogonal varimax method and examined. The five-factor solution, which accounted for 57.7% of the total variance, had a good structure, and compared to the other solutions, it could be most meaningfully interpreted. Across the 24 facets, the percentage of variance within each facet explained by the five-factor solution (communalities) ranged from 0.33 to 0.76 (Table 5). The first factor explained 15.7% of the variance and included facets relating to the *physical health* (physical and level of independence domains). The second factor (*mental health*) explained 14.9% of the variance and was defined by the positive feelings, cognitive skills (thinking, learning, memory, and concentration), self-esteem, personal relationships, leisure opportunities, and spirituality. The third factor (*social relationships*) explained 11.3% of the variance and encompassed the facets related to the environment and social relationships domains. The fourth factor explained 8.1% of the variance and comprised the facets related to different domains. We called it *psychological state* because all the incorporated facets were reflecting very personal and important aspects of person's psychological state (body image and appearance, negative feelings, personal relationships, sexual activity and physical safety and security). The fifth factor (*environment*) explained 7.7% of the variance and included four facets from the environment domain.

## Discussion

This study has tested the validity and reliability of the Lithuanian translation of the WHOQOL-100 with different psychometric tests. The WHOQOL-100 instrument was developed collaboratively in more than 15 cultural settings over several years, and its psychometric properties have been found to be satisfactory in different cultures (15–21). Therefore, it may be possible to use this instrument to assess variations in QOL across different cultures, to compare subgroups within the same culture, and to measure changes across time in response to change in life circumstances. Our study has also shown that in Lithuania the WHOQOL-100 meets accepted psychometric standards and has satisfactory psychometric properties to assess the QOL in general urban population. It was important to examine the relationships between items, between facets, and between domains in order to investigate the construct (convergent and divergent) validity. Good construct validity requires that domains and facets should correlate significantly and positively. The proposed domain structure for the international WHOQOL-100 was confirmed by the data of our study.

Our results on the psychometric properties of the Lithuanian urban population are in accordance with the data of other authors. In China, 476 patients with chronic illness and 431 their family members filled out the WHOQOL-100 (15). Cronbach's  $\alpha$  ranged from 0.76 for the environment domain to 0.90 for the psychological domain in the patients' group and 0.79–0.87 in their caregivers' group. In the provided study, most facets had their strongest correlations within the domains to which they had been assigned for the exception for 5 facets. After principal component analysis, four factors explaining 61% of the variance were carried out. The first factor encompassed the facets relating to physical health, and the second one was defined by mental health. Similar results were found in Lithuanian study. In both studies, the factor structure found by the WHOQOL Group could not be completely confirmed. In the United States, the WHOQOL-100 was tested in a general adult population (16). The US version of the instrument had acceptable internal consistency – Cronbach's  $\alpha$  ranged from 0.82 to 0.95 (from 0.77 to 0.91 in our study) – and good test-retest results – ICC range was 0.83–0.96 at 2-week retest interval and 0.64–0.89 in our case. In Croatia in diabetic patients' sample, the WHOQOL-100 has also shown good internal consistency results:  $\alpha$  ranged from 0.76 in the social relationships domain to 0.95 in the physical domain (17). In general Danish population, Cronbach's  $\alpha$  coefficients of generic QOL instrument were acceptable in all six domains (0.78–0.95).

**Table 5. Factor loadings from the rotated factor structure  
(principal component analysis with varimax rotation, Kaiser normalization)**

The WHOQOL-100 facets	Rotated principal components					h <sup>2</sup>
	1	2	3	4	5	
Pain and discomfort	<b>0.57</b>			0.48		0.63
Energy and fatigue	<b>0.71</b>					0.68
Sleep and rest	<b>0.47</b>					0.33
Positive feelings		<b>0.68</b>				0.63
Thinking, learning and memory		<b>0.66</b>				0.59
Self-esteem		<b>0.74</b>				0.71
Body image and appearance				<b>0.54</b>		0.49
Negative feelings	0.42			<b>0.64</b>		0.61
Mobility	<b>0.70</b>					0.55
Activities of daily living	<b>0.77</b>					0.73
Dependence on medication	<b>0.75</b>					0.59
Working capacity	<b>0.73</b>	0.43				0.76
Personal relationships		<b>0.48</b>		0.41		0.58
Social support			<b>0.61</b>			0.52
Sexual activity				<b>0.41</b>		0.42
Physical safety and security				<b>0.48</b>	0.43	0.50
Home environment					<b>0.66</b>	0.56
Financial resources			<b>0.68</b>			0.58
Health and social care			0.43		<b>0.46</b>	0.47
Acquisition of new information		0.41	<b>0.57</b>			0.57
Leisure		<b>0.54</b>	0.49			0.60
Physical environment					<b>0.80</b>	0.69
Transport			<b>0.61</b>			0.50
Spirituality/religion/personal beliefs		<b>0.67</b>				0.56

Only factor loadings >0.4 are presented. Loadings with higher values are in bold (some facets were attributed to several factors). The original WHOQOL-100 domains are separated. h<sup>2</sup> – communalities, 1 – physical health, 2 – mental health, 3 – social relationships, 4 – psychological state, 5 – environment.

(18). Test-retest reliability evaluated by Spearman's correlations was also high (0.81–0.91). When the mean scores of the WHOQOL-100 were compared between general Danish and Lithuanian populations, QOL in Lithuanian population was found to be significantly lower in all the domains with the exception for the spirituality domain. The WHOQOL-100 showed acceptable psychometric properties in the United Kingdom in primary care patients with moderate depression (19). Internal consistency reliability for independence, environment, and spirituality domains exceeded 0.9, and the other three domains showed very good Cronbach's  $\alpha$  values of 0.82–0.89. The reliability of the WHOQOL-100 was also tested in London in chronic pain patients' group (20). Very high and high Cronbach's  $\alpha$  (0.73–0.94) were recorded for

all WHOQOL-100 domains, indicating that the individual interpretation of scores is reliable in all domains.

In our study, the overall assessment of QOL was most strongly associated with the environment and psychological domains, and the overall health showed the strongest association with the level of independence and physical domains. In the other population-based studies, the results also showed a strong association of general items with the WHOQOL-100 and the WHOQOL-BREF domains indicating that each one should be considered when evaluating QOL (2, 21).

*Limitation of the study.* We cannot assert that the study population is perfectly representative of general Lithuanian population. Our study sample represents Kaunas city population, which has about 400 000 inhabitants.

### Conclusions

The WHOQOL-100 showed results of high reliability and high convergent and divergent validity; therefore, the WHOQOL-100 is a suitable instrument for

evaluating quality of life among middle-aged population. These estimates may serve as norms for the urban Lithuanian population.

## Pasaulio sveikatos organizacijos „Gyvenimo kokybės 100“ klausimyno tinkamumo įvertinimas vidutinio amžiaus Kauno gyventojų populiacijoje

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**Raktažodžiai:** gyvenimo kokybė, PSO-100, validumas, stabilumas.

**Santrauka.** *Tyrimo tikslas.* Įvertinti Pasaulio sveikatos organizacijos „Gyvenimo kokybės 100“ klausimyno tinkamumą vidutinio amžiaus Kauno gyventojų gyvenimo kokybei tirti.

*Tyrimo medžiaga ir metodai.* Tiriamųjų kontingentą sudarė atsitiktinai atrinkti ir sugrupuoti pagal amžių bei lytį 1403 35–64 metų Kauno gyventojai. Gyvenimo kokybė tirta naudojant pačių tiriamųjų užpildomą Pasaulio sveikatos organizacijos „Gyvenimo kokybės 100“ klausimyną.

*Statistinė analizė.* Kiekvieno tiriamojo užpildyto klausimyno atsakymų variantai buvo perskaičiuoti standartizuotais balais visoms septynioms gyvenimo kokybės sritims, kur minimalus galimas balų skaičius 0, maksimalus – 100. Klausimyno tinkamumui įvertinti apskaičiuotas Pirsono koreliacijos koeficientas, Kronbacho  $\alpha$  rodiklis, atlikta faktorinė analizė. Sąsajos tarp bendrųjų klausimų apie gyvenimo kokybę bei sveikatą ir gyvenimo kokybės sričių analizuotos tiesinės regresijos metodu.

*Rezultatai.* Klausimyno sričių balai nustatyti nuo  $51,3 \pm 15,1$  (benroji gyvenimo kokybė) iki  $72,0 \pm 16,4$  (nepriklausomumo sritis). Nustačius klausimyno validumą, vidinį bei matavimo stabilumą, atlikta tolimesnė analizė (Kronbacho  $\alpha$  rodikliai –  $0,77$ – $0,91$ ). Nustatyta, kad bendrajai gyvenimo kokybei didžiausios įtakos turėjo aplinkos ( $\beta=0,31$ ), psichologinė ( $\beta=0,18$ ) ir socialinių santykių sritys ( $\beta=0,17$ ), sveikatai (G4) – nepriklausomumo ( $\beta=0,34$ ) ir fizinė sritys ( $\beta=0,18$ ). Atlikus faktorinę analizę, išskirti penki bendrieji veiksniai, kurie paaiškino 57,7 proc. bendrosios kintamųjų dispersijos.

*Išvada.* Pasaulio sveikatos organizacijos „Gyvenimo kokybės 100“ klausimynas yra tinkama priemonė vidutinio amžiaus Kauno populiacijos gyvenimo kokybei tirti.

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