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RAPID REVIEW

Effectiveness of Interventions to Prevent Youth Substance Use

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Key Findings

- Since the publication of an overview of systematic reviews on youth substance use prevention in 2016, we found 16 relevant systematic reviews were published, mainly from the United States.
- Most of the additional literature addressed school-based and family-based interventions, and generally results for all interventions were similar to the 2016 overview of systematic reviews.
- Additional information was available in the recent literature for peer-led school interventions, school policies, and individual interventions.

Background and Scope

- As part of a comprehensive approach to substance use, public health units are undertaking activities that include leading or partnering on interventions to prevent or delay the onset of substance use among youth.
- This response focuses on the question, "What is the most recent evidence on the effectiveness of substance use prevention interventions among youth aged 11-24?"
- PHO has prepared a separate synopsis of the Das et al (2016) overview of systematic reviews (overview of reviews).[1,2] This report summarizes evidence from more recent systematic reviews.
- The intent of providing both summaries is to provide up-to-date information to practitioners on interventions to prevent youth substance use.

Methods

- The quality of the overview of reviews on interventions for adolescent substance use[1] was assessed using the Health Evidence quality appraisal tool.[3]

- PHO Library Services conducted a literature search (MEDLINE, Embase, PsychINFO, CIHAHL, SocINDEX) of the literature published since 2015 to current (searches conducted September 2018) on the broad topic of interventions to prevent youth substance use. The search was limited to systematic reviews.

- Two reviewers screened titles and abstracts, followed by full-text articles and reached consensus on the set of included articles using the following inclusion criteria:

    - Design: systematic review (searched 3 or more databases, described methods, used quality appraisal tool)

    - Population: includes youth age 11 – 24 years

    - Intervention: focused on primary prevention of substance use; intervention types included, but were not limited to, school-based, family-based, digital, policy, incentives, or multi-component interventions

    - Comparison: systematic reviews included studies with or without a comparison group used, including pre-post comparison

    - Outcome: substance use onset; prevalence of substance use (substance use includes tobacco, alcohol, or other drugs)

- We excluded articles with a primary focus on a sub-group of the general youth population (although articles could include analysis of subgroups as part of the review), although all settings were eligible (e.g., attending educational institution or other setting)

- We applied the Healthevidence.org Quality Assessment Tool for Review Articles[3] to assess the overall strength of the evidence by category of intervention. Articles rated weak (score of four out of 10 or below) were excluded. Two reviewers conducted quality appraisal independently, and agreed on the quality rating using consensus discussion.

- One reviewer extracted information from each article using a standardized extraction template.

Results

- We included one overview of systematic reviews (overview of reviews) and 16 more recent systematic reviews (four of which included meta-analysis).

- The main findings of the rapid literature review are summarized below. Data extraction tables are available on request.

- Age ranges included in these studies range from age four to 24, and most literature was conducted in high-income countries (primarily United States). The literature is primarily based on randomized controlled studies with almost all reviews including some studies with outcomes over 12 months.

School-based Interventions

OVERVIEW OF REVIEWS

- The overview of reviews found that school-based interventions were associated with some prevention outcomes (uptake or prevalence of use) including lower risk of smoking uptake (at longest follow-up), cannabis use, and drug use (follow-up under 12 months). There was also an association with decreased frequency and quantity of alcohol use.[1] Lifetime alcohol use and smoking prevalence at long-term follow-up (grade 12, or 18 years of age) were not significantly different.[1] Interventions with combined social competence (e.g., self-esteem, coping, problem solving) and social influence curricula (e.g., dealing with peer pressure, refusal) were associated with improved outcomes, and information-only interventions were ineffective.[1]

ADDITIONAL REVIEWS

- In addition to the Das et al., (2016) overview of reviews, there were five systematic reviews (four included a meta-analysis) that analyzed school-based interventions on preventing substance use.[4-8]

- There were different types of school-based interventions that emerged from the literature; these included peer-led school interventions, integrated academic and health education programs and universal or targeted school-based interventions.

- Peer-led school interventions involved peers who were either nominated by their classmates or selected by staff/researchers and were part of a health promotion curriculum or led discussions or group work, while teachers acted as facilitators or supervisors.[4]

- Integrated academic and health education programs involved combining health education components into the usual academic curriculum (e.g., designing alcohol awareness posters in art class).[5]

- Universal school-based interventions focused on the general school population while targeted school-based interventions focused on students from low socioeconomic backgrounds or students with behavioural problems.[6] The majority of programmes in all age groups included health education with skills training that commonly included problem solving or decision-making skills and refusal skills.[6] The most common theoretical orientation of the programmes for most age groups was the social influence approach.[6] Other social-based theories or models that were used included social learning theory, theory of triadic influence, social cognitive theory, social development or positive youth development.[7]

TOBACCO USE

- In comparison to Das et al., (2016), the additional reviews found similar results. However, when broken down by age group, there was mixed effectiveness within different types of school-based interventions for preventing tobacco use.

- Peer-led school interventions show a significantly lower odds of weekly or monthly smoking compared to those in the control arm with pooling of all data from adjusted and unadjusted estimates (OR = 0.78; 95% CI: 0.62 to 0.99).[4]

- Integrated academic and health education programs showed a statistically significant effect in being less likely to have ever smoked tobacco among children ages seven to 11 based on student report but not by teacher report (Positive Action Hawaii trial: student report, OR = 0.52, 90% CI: 0.31 to 0.88; teacher report, OR = 0.54, 90% CI: 0.28 to 1.02) and less likely to have initiated smoking among youth ages 16 to 18 (Linking the Interests of Families and Teachers (LIFT) trial, OR = 0.90, p<0.01), but no effect for tobacco smoking among ages 11 to 14 or 14 to 16.[5]

- Universal school-based interventions showed a significant effect on smoking behaviour (smoking in the past 30 days or smoking initiation) among grade one to grade nine, but not for grade 10 to 12.[6] Additionally, another systematic review and meta-analysis demonstrated effectiveness in the short-term (under 12 months) (OR = 0.77, 95% CI: 0.60 to 0.97), but not long-term follow-up (over 12 months).[8] Further, universal school-based "resilience" (addressing at least one individual and one environmental protective factors of resilience; e.g., coping, empathy, self-esteem, caring relationships, meaningful participation, support) interventions in another meta-analysis were not associated with a difference in tobacco use outcomes (e.g., prevalence or number of cigarettes).[7]

- Targeted high-risk school-based interventions among students from low socioeconomic backgrounds or students with behavioural problems showed effectiveness on smoking behaviour (combined outcomes, including percentage of students smoking and number of cigarettes smoked) in students from grade six and seven (d = -0.12, 95% CI: -0.17 to -0.07) and 10 to 12 (d = - 0.35, 95% CI: -0.48 to -0.21), but not for students in grades one to five and eight to nine.[6]

ALCOHOL USE

- In comparison to Das et al., (2016), the additional reviews found similar results. However, when stratified by age group, there was mixed effectiveness within different types of school-based interventions for preventing alcohol use.

- Peer-led school interventions showed a significantly lower odds of alcohol use (e.g., frequency or volume of alcohol consumption) compared to those in the control arm with a pooled analysis of all studies (OR = 0.80, 95%CI: 0.65 to 0.99).[4]

- Integrated academic and health education programs showed a statistically significant effect in being less likely to have ever used alcohol among children ages seven to 11 (OR = 0.48, 90% CI: 0.34 to 0.68) and less likely to have initiated alcohol use among youth ages 16 to 18 (OR = 0.93, p<0.05), but no effect for reducing alcohol use (e.g., frequency of alcohol consumption or any alcohol consumption in past year) among ages 14 to 16.[5]

- Universal school-based interventions showed a significant effect on alcohol use (e.g., initiation or frequency of alcohol consumption) in one systematic review and meta-analysis (OR = 0.72, 95% CI: 0.56 to 0.92),[8] among grade one to grade seven students but not for grades eight to 12 in another systematic review and meta-analysis,[6] and universal school-based 'resilience' interventions did not have an effect on alcohol use.[7]

- Targeted high-risk school-based interventions among students from low socio-economic backgrounds or students with behavioural problems showed effectiveness for alcohol use (e.g.,

number of alcoholic drinks consumed) among students from grade six and seven (d = - 0.10, 95% CI = - 0.15 to – 0.04) and 10 to 12 (d = -0.32, 95% CI = - 0.55 to – 0.08), but not for students in grades one to five and eight to nine.[6]

DRUG USE

- In comparison to Das et al., (2016), there were similar results in the additional reviews with positive effectiveness of school-based interventions for preventing drug use.

- Peer-led school interventions were associated with lower odds of cannabis use (e.g., monthly use) compared to those in the control arm with a pooled analysis of three studies (OR = 0.70, 95% CI: 0.50 to 0.97.[4]

- Integrated academic and health education programs were significantly associated with being less likely to ever use illegal drugs among children ages seven to 11 (OR = 0.28, 90% CI: 0.14 to 0.54) and less likely to have initiated drug use among youth ages 16 to 18 (OR = 0.91, p<0.10).[5]

- One systematic review found universal school-based interventions that address factors to promote 'resilience' are shown to be effective in reducing the prevalence of illicit drug use (i.e., any drug or specific drug, such as cannabis) (OR = 0.78, 95% CI: 0.6 to 0.93).[7] Another systematic review found universal school based interventions had a significant effect on prevalence of drug use among elementary school children (grade 1 to 5, d = - 0.14, 95% CI: - 0.28 to – 0.01; grade 6 and 7, d = - 0.14, 95% CI: - 0.20 to – 0.08).[6] However, the same review found no effect for grades 8 to 12 on prevalence of drug use.[6] In a meta-analysis that was conducted among students up to 18 years of age, universal school-based interventions can be associated in the long-term (e.g., follow-up 12 months or longer after intervention) with lower illicit drug use (OR=0.73, 95% CI: 0.56 to 0.95).[8] There was also significant effect of universal school-based interventions on cannabis use.[8]

- Targeted high-risk school-based interventions on students from low socio-economic backgrounds or students with behavioural problems showed effectiveness on drug use when aimed at students in grades six and seven and grades 10 to 12, but not for students in grades one to five and grades eight to nine,[6] and were not effective in another systematic review and meta-analysis.[8]

Family-based Interventions

OVERVIEW OF REVIEWS

- The overview of systematic reviews found that family- or community-based interventions were associated with some prevention outcomes (initiation or prevalence of use) including lower risk of smoking initiation, alcohol use, and drug use.[1] These interventions were not associated with smoking prevalence, weekly or monthly smoking.[1] High-intensity family-based programs were associated with improved outcomes for smoking initiation, and programs that emphasized parental involvement and development of social competence, self-regulation and parenting skills were strongest for preventing any substance use.[1]

ADDITIONAL REVIEWS

- In addition to the Das et al. (2016) overview of reviews, there were six systematic reviews (three included meta-analysis) that analyzed family or parent-based interventions on preventing substance use.[8-13]

- The term family-based and parent-based were both found in the literature, where half of the reviews used family-based[8-10] and the other half used parent-based.[11-13] Both refer to the same kind of interventions that focused on parents and sometimes included children/youth.

- The content of family/parent-based interventions was heterogeneous within reviews. Interventions ranged from low intensity programs that were self-directed using tools such as printed booklets and online modules to high intensity programs that were directed by teachers, social workers or staff with content expertise in workshops or education sessions.[8,13]

TOBACCO USE

- In comparison to Das et al., (2016), there were similar results in the additional reviews with mixed effectiveness for family or parent-based programs on tobacco use.

- Family-based interventions were associated with significantly fewer students initiating smoking compared to controls (RR = 0.76, 95% CI: 0.68 to 0.85).[9] High intensity family interventions showed the most effectiveness (RR = 0.71, 95% CI: 0.61 to 0.82).[9]

- One systematic review found that parent-based interventions demonstrated effectiveness at each study time period for tobacco outcomes (use, initiation or intention) (X score ranged from 4.34 at <12 months to 14.10 at > 48 months, all P values < .001).[11] Another systematic review studied the effect of parent-based interventions by age, sex (recorded as female, male, or mixed), and race/ethnicity, and found effectiveness for tobacco outcomes (initiation or use) among studies that included both male and female youth, young adolescents or multiple age groups, and those focused on multiple or specific racial/ ethnic groups (except for one study among Asian-American participants).[12]

- In another systematic review of family-focused interventions in primary school children (age 5-12), there were one negative and two positive studies addressing smoking prevention outcomes of initiation or use in the past month at follow-up, although outcomes were not combined due to heterogeneity. [10] Family-based interventions (universal or targeted to high risk adolescents, for instance, those who experience homelessness or have parents in treatment for substance use) did not show statistically significant differences for regular tobacco use in a meta-analysis of interventions targeting multiple risk behaviours.[8]

ALCOHOL USE

- In comparison to Das et al. (2016), there were similar results in the additional reviews with an overall positive effectiveness for family or parent-based interventions for alcohol use.

- One systematic review and meta-analysis found that across all drinking outcomes (e.g., quantity, binge drinking, drunkenness, lifetime use, intention), the effect of family or parent-based interventions preventing or reducing alcohol use was significant (g=−0.23, 95% CI: −0.35 to −0.10).[13] Another systematic review found an overall significant effect (X score range 8.69 at 12.1 – 24 months to 12.99 at > 48 months, all time points p < 0.0001) for preventing or reducing

alcohol use (intention, initiation or use).[11] Likewise, one systematic review found parent-based interventions were effective in preventing or decreasing alcohol in studies among females only or both males and females; young adolescents or multiple age groups; and among multiple or specific racial/ ethnic groups.[12]

- A systematic review and meta-analysis did not find significant effects for family-based interventions that were universal or targeted to high risk youth on alcohol use (e.g., initiation, frequency, or binge drinking).[8]

DRUG USE

- In comparison to Das et al., (2016), there were similar results in the additional reviews where overall there was positive effectiveness for family or parent-based interventions for illicit drug use and poly drug use.

- One systematic review found overall effectiveness for preventing or reducing illicit drug use (X score range 8.61 at > 48 months to 13.10 at 12.1 to 24 months, all p values < 0.0001).[11] Another systematic review showed parent-based interventions to be effective in preventing or decreasing illicit drug use in studies among female only or males and females; young adolescents or multiple age groups; and among different racial/ ethnic groups, except for Black/African Americans.[12]

- A systematic review and meta-analysis found targeted family-based interventions did not have an influence on illicit drug use (meta-analysis of targeted programs only) or cannabis use (meta-analysis of universal and targeted programs).[8]

- One systematic review found overall effectiveness for preventing and reducing polydrug use (three of four studies with positive outcomes).[11] Another systematic review found parent-based interventions were effective for preventing or reducing polydrug use in studies among multiple genders, young adolescents or mixed age groups, and specific racial/ ethnic groups, but not among studies involving multiple racial/ethnic groups.[12]

Digital Interventions

OVERVIEW OF REVIEWS

- The overview of systematic reviews found that digital interventions were associated with some prevention outcomes (uptake or prevalence of use) including the potential for mass media campaigns to prevent smoking uptake and for internet-based programs to prevent substance use (e.g., smoking prevalence).[1] However, there were methodological weaknesses noted regarding this literature. There may be some effect of digital interventions on reducing quantity or frequency of alcohol use, but these effects may not offer an advantage compared with alternate interventions.[1]

ADDITIONAL REVIEWS

- In addition to the Das et al., (2016) overview of reviews, there were two systematic reviews that analyzed mass media or digital interventions on preventing substance use.[14,15]

TOBACCO USE

- In comparison to Das et al., (2016), there were similar results in the additional review with mixed effectiveness for mass media interventions (e.g., radio and TV) on tobacco use (e.g., daily, weekly, monthly).

- In the systematic review by Carson et al., (2017), three of eight studies found significant effects of mass media interventions on smoking behaviour among youth (e.g., frequency of smoking).[14] For example, a media campaign, aimed primarily at girls, in Norway showed a lower overall increase in the proportion of female daily smokers at one-year follow-up compared to the control county (8.6% compared with 12.4% respectively, $P < 0.01$).[14] While a study in the US and the influence of TV messages designed to prevent the uptake of smoking in 10 to 12 year olds, did not find statistically significant differences between the intervention and control counties.[14]

ALCOHOL USE

- In comparison to Das et al., (2016), there were similar results in one additional review where there was positive effectiveness for eHealth behavioural interventions on alcohol use in the short-term (average intervention duration was one month).

- eHealth interventions combine the use of technologies, such as internet and smartphones to facilitate behavior change and improve health.[15] Most eHealth interventions used one technology followed by two types of technology. The most commonly used technology were websites, followed by emails, text messages, computers (e.g., computer-based assessment and feedback), monitoring devices (i.e., pedometers), and mobile apps.[15]

- A meta-analysis of eight homogeneous studies that included 10 intervention arms, found a lower mean number of drinks consumed per week in the intervention group (web or computer-based intervention) compared to controls (MD = −2.43, 95% CI: −3.54 to −1.32) at follow-up 4 to 52 weeks post-baseline.[15]

Policy Interventions

OVERVIEW OF REVIEWS

- The overview of systematic reviews found that exposure to tobacco advertising was associated with higher prevalence of tobacco use, and restrictions on youth access to tobacco sales were not associated with prevalence of tobacco use, while summary outcomes on tobacco sales were not reported.[1] Few studies addressed school tobacco policies or alcohol advertising.[1] There were no included systematic reviews on policies related to drug use or to substance use overall.[1]

ADDITIONAL REVIEWS

- In addition to the Das et al., (2016) overview of reviews there was one systematic review that analyzed policy interventions on preventing substance use.[16]

TOBACCO USE

- In comparison to Das et al., (2016), there were different results in the additional review where one review included several studies demonstrating effectiveness of school level policy interventions on tobacco use.

- Examples of school policies include smoking bans, policy orientation towards abstinence and harm minimization principles, penalty on possession of tobacco products among students; tobacco-free school policy, and reduced tobacco promotion and availability around schools.[16]

- In the systematic review by Sing et al., (2017), five studies reported significant reduction in tobacco use among those exposed to the intervention (e.g., Policy intention – smoking prevalence; $\beta = -0.11$, $P < 0.05$) while two studies did not find significant differences between those exposed and not exposed to the policy (e.g., Smoking ban – current smoking; OR = 0.86, 95% CI: 0.59 to 1.25).[16]

ALCOHOL USE

- In comparison to Das et al., (2016), there were similar results in the additional review where there was little effect of school level policy interventions on alcohol use (e.g., current use, binge use, use on school grounds, alcohol-related harm).

- There was one study within a systematic review that tested the association between school-level policies on different alcohol outcomes. Policies with abstinence-based alcohol messages and harm minimization messages had no effect on consuming alcohol on school grounds and current alcohol use. When students believed the policy enforcement was not strict, the chances of students consuming alcohol on school grounds were higher (OR = 1.48, 95% CI: 1.07 to 2.05). Policies with alcohol harm minimization messages had the only significant effect on decreasing student alcohol harm (OR = 0.83, 95% CI: 0.71 to 0.96).[16]

Incentive Interventions

OVERVIEW OF REVIEWS

- The overview of systematic reviews did not find benefit for incentives to prevent tobacco use, and did not find evidence addressing incentives to prevent other substance use.[1]

ADDITIONAL REVIEWS

- In addition to the Das et al., (2016) overview of reviews there were two systematic reviews (one included a meta-analysis) that analyzed incentive interventions on preventing substance use.[17,18]

TOBACCO USE

- In comparison to Das et al., (2016), there were similar results in the additional review where there was no effectiveness of smoke-free class competitions and financial incentives on tobacco use.

- Smoke-free class competitions include the following requirements: (i) at least 90% of the class must agree to participate (i.e. participation is voluntary); (ii) classes sign a contract and commit to remain smoke-free for six months (usually defined as greater than or equal to 90% of the class is non-smoking); (iii) classes and teachers monitor the smoking status of students and report regularly to the competition organisers as to whether at least 90% of the class remains non-smoking (usually monthly).[18]

- If classes report that less than 90% of the class are smoke-free, they are dropped from the competition. At the end of the six months, the classes in the competition that have remained

smoke-free have the chance of winning a prize, usually through a prize draw or lottery.[18] Types of prizes from the included studies in the review by Hefler et al., (2017) ranged from special activities (e.g. hip-hop classes) to monetary prizes and class trips.[18]

- In one systematic review, the pooled RR for the more robust RCTs (included three studies) showed no effect of incentives in smoke-free class competitions, to prevent smoking initiation among children and adolescents in the long term (RR = 1.00, 95% CI: 0.84 to 1.19).[18]

- Results that were not statistically significant were seen in another systematic review and meta-analysis of five studies with smoke-free class competitions on tobacco abstinence (OR = 0.83, 95% CI: 0.67 to 1.03) (sample sizes ranged from n = 1835 to 4372) and among three studies on financial incentives in the form of cash payments for tobacco abstinence (OR = 0.29, 95% CI: 0.06 to 1.42) (sample sizes ranged from n = 28 to 72).[17] Pooled results of all these studies did show a statistically significant effect on reducing smoking (OR = 0.80, 95% CI: 0.65 to 0.98).[17]

Individual-based Interventions

OVERVIEW OF REVIEWS

- The overview of systematic reviews did not specifically report on individual-based interventions.[1]

ADDITIONAL REVIEWS

- In addition to the Das et al., (2016) overview of reviews there were two systematic reviews (one included a meta-analysis) that analyzed individually-based interventions on preventing substance use.[8,19]

TOBACCO, ALCOHOL AND DRUG USE

- There was no effectiveness for universal or targeted individual-based interventions for tobacco use, alcohol use, cannabis use and illicit drug use.[8] Individual-level interventions included mentoring or motivational interventions, and targeted young people at risk (e.g. criminal justice involvement, or alcohol-related injury).[8]

- Positive youth development interventions also did not have any significant effects on reducing substance use generally across all time points (d = 0.079, 95% CI: 0.025 to 0.183) and for illicit drug use, alcohol and smoking separately.[19] Most positive youth development interventions were delivered after school or within a school setting and were programs delivered over the summer or alongside regular academic school year. Programs were diverse, but commonly included a life skills curriculum with academic support as well as mentoring from trained professionals.[19]

Multi-component Interventions

OVERVIEW OF REVIEWS

- The overview of systematic reviews found that multi-component interventions delivered in various settings were associated with reduced lifetime or regular tobacco use, but were not associated with 30-day tobacco use.[1] For alcohol, these interventions may reduce lifetime or 30-day use, but may not be superior to interventions in single settings. Similarly, studies conducted

in various settings, measuring outcomes for multiple substances at long-term follow-up, found an association with reduced tobacco, alcohol, and cannabis use (e.g., past 30 days).[1]

ADDITIONAL REVIEWS

- In addition to the Das et al., (2016) overview, there were two systematic reviews (one used meta-analysis) that analyzed multi-component interventions on preventing substance use.[9,14]

TOBACCO USE

- In comparison to Das et al., (2016), there were similar results in the additional review where there was positive effectiveness for multi-component interventions on tobacco use.

- One systematic review analyzed three studies that combined mass media (mostly through television) with school based interventions. One of the studies found mass media and school-based compared to school-based alone was statistically significant for lowering the risk of weekly smoking (OR = 0.62, 95% CI: 0.49 to 0.78) and another study found significantly lower smoking initiation rates in the intervention schools compared to control schools, while one study did not find a statistical difference.[14]

- A systematic review and meta-analysis found combined family and school interventions were significantly beneficial for preventing smoking compared to school-only intervention (RR = 0.85, 95% CI: 0.75 to 0.96).[9]

Limitations

- This review includes systematic review-level literature only, and lacks detail on the interventions used in the primary studies.

- We used quality appraisal to exclude weak articles, but opted not to discuss the quality ratings throughout the summary of results due to brevity (available by request).

- Misclassification of sex and gender may have occurred in our summary of literature, as the review-level studies might have presented results by sex (e.g., female, male), where primary study methods may have actually used self-identified gender (e.g., girl, boy).

- Most included studies occurred in high-income countries (e.g., United States), and may not be generalizable to other contexts. Further, trends in substance use may change over time with other policy or social changes, making it difficult to interpret longer-term study outcomes.

- The interpretation of findings that differed between various age groups was interpreted by the review authors as having implications for considering a developmental perspective within school-based programs, although the findings may also vary due to underlying prevalence of substance use across age groups and the sample sizes used in the included studies.

Conclusion

- Since the publication of an overview of systematic reviews on youth substance use prevention in 2016, we found 16 relevant systematic reviews were published, mainly from the United States.
- Most of the additional literature addressed school-based and family-based interventions, and generally results for all interventions were similar to the overview of systematic reviews.
- Additional information was available in the recent literature for peer-led school interventions, school policies, and individual interventions.

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