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## Measuring the Adoption of Consistent Use of Condoms Using the Stages of Change Model

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### SYNOPSIS

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THE STAGES OF BEHAVIOR CHANGE MODEL has been used to understand a variety of health behaviors. Since consistent condom use has been promoted as a risk-reduction behavior for prevention of human immunodeficiency virus (HIV) infection, an algorithm for staging the adoption of consistent condom use during vaginal sex was empirically developed using three considerations: HIV prevention efficacy, analogy with work on staging other health-related behaviors, and condom use data from groups at high risk for HIV infection. This algorithm suggests that the adoption of consistent condom use among persons at high risk can be meaningfully measured with the model. However, variations in the algorithm details affect both the interpretation of stages and apportionment of persons across stages.

A number of programs to prevent the spread of the human immunodeficiency virus (HIV) attempt to persuade persons to eliminate or modify practices that put them at increased risk of HIV infection or transmission. The AIDS Community Demonstration Projects (ACDP), funded by the Centers for Disease Control and Prevention, is one such program (1). This project is a multisite HIV prevention demonstration located in five communities across the United States. The project targets hard-to-reach groups of persons at risk of infection with HIV, including injecting drug users (IDUs), women who are or may be sex partners of IDUs (FSPs), female prostitutes (or commercial sex workers [CSWs]), and youth in high-risk situations (YHRS). (The ACDP also targets men who have sex with men but do not self-identify as gay; however, there were too few respondents in the baseline or preintervention sample to permit meaningful analysis of their data.) A major goal of the ACDP is to increase the correct and consistent use of condoms.

The success of such HIV prevention efforts relies on changing specific behaviors, and accurate assessment of behavior change is crucial to the evaluation of program effectiveness. Behavioral research suggests that the process of adopting a new behavior or eliminating a bad habit is complex and occurs in small steps as a person slowly progresses through a series of cognitive and behavioral changes (2). Since the typical strategies for measuring program

Table 1. Basic demographic characteristics of study populations

Subpopulation	Total (N=)	Sex (%)		Age (years)		Race/ethnicity (%)				Vaginal sex with partner type (%)	
		M	F	Mean	SD	Black	Hisp.	White	Other	Main	Other
Injecting drug users:											
Denver	211	89.1	10.9	34.8	7.6	33.6	14.7	49.8	1.9	52.6	64.9
Long Beach	330	82.7	17.3	37.9	7.7	57.9	17.6	22.1	2.4	62.1	57.0
Prostitutes:											
Long Beach	267	...	100.0	32.0	7.0	66.7	13.5	15.4	4.4	45.3	95.5
Seattle	127	...	100.0	32.2	7.3	71.1	1.6	21.9	5.4	57.8	91.4
Female sex partners:											
Long Beach	93	...	100.0	34.8	8.1	58.1	15.1	23.7	3.2	96.8	10.8
New York	272	...	100.0	32.9	6.2	18.4	78.7	1.8	0.7	100.0	3.7
Youth in high-risk situations:											
Seattle	226	56.2	43.8	18.0	2.4	11.5	8.4	60.2	19.9	65.5	45.1
Community:											
Dallas	515	78.4	21.6	35.1	9.7	90.5	2.5	6.8	0.2	55.3	60.6

SD=Standard deviation

outcomes do not take this complexity into account, important progress toward making changes in behaviors can be missed.

Because we know that behavior change typically occurs through a series of steps, we investigated the stages of change (SOC) model (2) as a conceptual framework for measuring behavior change among persons in the ACDP. The SOC model describes a series of stages through which people move as they change a specific behavior. Following the most recent description of the model (3), there are five stages through which people move in making a health behavior change: precontemplation, a stage in which there is no intention to change behavior in the foreseeable future; contemplation, a stage in which there is intention to change at some point, but not in the near future; ready-for-action, a stage in which there is a firm intention to change in the near future and some preliminary attempts to do so; action, a stage in which the new behavior is being practiced; and maintenance, a stage during which the behavior has been practiced for a minimum length of time.

We found using the SOC model for measurement attractive for practical, as well as theoretical, reasons. Evaluation data for our projects are collected in brief street interviews, a situation not conducive to the use of extensive measurement tools. The SOC model offers the prospect of obtaining a sensitive measure of behavior change using a few simple questions.

The application of the SOC model to our research presents some challenges. In contrast to extensive research and application in the area of psychotherapy (4) and smoking cessation (5), development of SOC measures related to HIV risk reduction is in the preliminary stages (6, 7).

To use the SOC model effectively for these new behaviors, the criteria for determining stage of change must be clear and well understood. The operational definition of the stages may affect the ability to detect stage movement following intervention as well as the ability to identify factors which signal progress through the stages. Also, the selection of different criteria for stage classification will make it difficult to compare evaluation results across programs. The purpose of this paper is to describe the construction of an SOC algorithm for measuring adoption of consistent condom use for vaginal sex.

## Methods and Procedures

**Data collection.** As a part of the ACDP, preintervention data were collected in the spring of 1991 in Dallas; Denver; Long Beach, CA; New York City; and Seattle. Trained interviewers went to predetermined locations in the community, typically small geographic areas such as a series of blocks along a street or a park. These areas were identified by ethnographic assessment as areas where people practicing high-risk behaviors could be approached (for example, prostitute strolls, places where street drugs are sold). Once there, interviewers followed a protocol for randomly engaging in people who were gathered in or passing through these areas. Coupons redeemable by nearby businesses or small amounts of cash were offered to compensate respondents for their time. When the same respondent was interviewed more than once, only the first interview was used.

The data collection instrument consisted of two parts. The first part determined whether or not a respondent was a member of one of the populations of interest and was cur-

**Table 2. Percent of risk group members reporting using a condom the last time they had vaginal sex, by reported relative frequency of condom use**

Risk group and city	Relative frequency of condom use									
	Every time		Almost every time		Sometimes		Almost never		Never	
	Partner type		Partner type		Partner type		Partner type		Partner type	
	Main	Other	Main	Other	Main	Other	Main	Other	Main	Other
<b>Injecting drug users:</b>										
Denver	75 (4)	50 (4)	57 (7)	47 (19)	13 (6)	13 (30)	0 (11)	8 (26)	1 (73)	0 (59)
Long Beach	100 (3)	94 (16)	69 (13)	65 (34)	6 (18)	20 (35)	0 (17)	11 (18)	1 (154)	1 (85)
<b>Prostitutes:</b>										
Long Beach	100 (8)	98 (108)	80 (5)	75 (68)	15 (13)	20 (41)	13 (8)	8 (12)	0 (87)	0 (26)
Seattle	100 (2)	96 (53)	86 (7)	60 (45)	40 (10)	38 (13)	0 (6)	0 (4)	2 (49)	0 (2)
<b>Female sex partners:</b>										
Long Beach	100 (7)	...	50 (2)	...	17 (6)	...	20 (5)	...	0 (70)	...
New York	94 (50)	...	75 (12)	...	32 (25)	...	6 (31)	...	2 (154)	...
<b>Youth in high-risk situations:</b>										
Seattle	100 (30)	93 (30)	57 (14)	51 (41)	30 (27)	31 (13)	13 (23)	0 (10)	6 (54)	0 (8)
<b>Community:</b>										
Dallas	100 (12)	83 (33)	91 (22)	54 (41)	43 (35)	20 (76)	0 (16)	13 (40)	0 (200)	0 (115)
Median	100	94	72	57	21	20	3	8	1	0

rently sexually active or injecting drugs. The second part elicited detailed information about condom use during vaginal and anal intercourse. For those who reported injecting drugs, information concerning sharing and cleaning of injection equipment was obtained.

**Sample.** For the purposes of this analysis, each respondent was categorized into one of five mutually exclusive groups. Women who stated that they had received money or drugs for sex in the last 30 days were classified as prostitutes or CSWs (N=394). Respondents stating that they had injected street drugs in the last 30 days (who were not CSWs) were classified into the population of IDUs (N=541). Women not classified as IDUs or CSWs, but who stated that they believed a recent (within previous 30 days) sex partner had injected street drugs in the last few years were classified as FSPs (N=365). In Seattle, youth were recruited in areas where young runaways and "throwaways" were known to visit, congregate, or participate in the street economy. For this analysis, only persons 24 years of age or younger and who spent nights away from their parents' or legal guardians' home were classified as YHRS (N=226). In Dallas, where intervention is directed to residents of selected low socioeconomic census tracts (as opposed to specific risk behavior groups), adults who were sexually active in the 30 days prior to the interview were classified as sexually active community members (COMM) (N=515).

**Measurements.** Condom use varies depending on the type of partner (main or other) and the type of intercourse

reported (vaginal, anal, or oral) (8, 9). In this analysis, we focus on two behaviors: vaginal sex with main partner and vaginal sex with other partners. (Among CSWs, "other partner[s]" refers to partners with whom they have exchanged sex for money, drugs, or other things of value.) To assess stage of change for each behavior, four variables were measured: frequency and duration of a criterion behavior and future and immediate intentions with respect to that behavior.

**Behavioral criterion.** The first step in developing a stage of change algorithm was the identification of a criterion behavior. The choice of a criterion behavior may be arrived at by consensus of the scientific or public health community. For example, with smoking behavior, the consensus of the public health community is that the criterion should be abstinence from all smoking; cutting down or switching to low-tar brands is insufficient.

For condom use, correct and consistent use is regarded as necessary for protection from sexually transmitted diseases (10, 11, 12). Thus, everytime use of condoms for vaginal sex with one's main (or other) partner(s) was set as the behavioral criterion.

**Relative frequency of condom use.** To assess frequency of condom use, each respondent was asked, "When you have vaginal sex with your main (or other) partner(s), how often do you use a condom?" Respondents answered on a five-point scale: every time, almost every time, sometimes, almost never, or never.

**Table 3. Percent of risk group members reporting positive<sup>1</sup> immediate intention<sup>2</sup> to use condoms consistently during vaginal sex, by reported relative frequency of condom use**

Risk group and city	Relative frequency of condom use									
	%(N)									
	Every time		Almost every time		Sometimes		Almost never		Never	
	Partner type		Partner type		Partner type		Partner type		Partner type	
	Main	Other	Main	Other	Main	Other	Main	Other	Main	Other
<b>Injecting drug users</b>										
Denver	100 (4)	50 (4)	100 (7)	95 (19)	63 (16)	57 (30)	27 (11)	42 (26)	18 (73)	29 (58)
Long Beach	100 (3)	94 (16)	100 (13)	100 (34)	78 (18)	83 (35)	35 (17)	50 (18)	13 (154)	32 (85)
<b>Prostitutes:</b>										
Long Beach	100 (8)	98 (108)	100 (5)	93 (68)	46 (13)	68 (41)	38 (8)	33 (12)	15 (87)	46 (26)
Seattle	100 (2)	96 (53)	100 (7)	98 (45)	80 (10)	92 (13)	33 (6)	25 (4)	18 (49)	100 (2)
<b>Female sex partners:</b>										
Long Beach	100 (7)	...	100 (2)	...	17 (6)	...	60 (5)	...	13 (70)	...
New York	98 (50)	...	100 (12)	...	64 (25)	...	1 (31)	...	13 (154)	...
<b>Youth in high-risk situations:</b>										
Seattle	100 (30)	100 (30)	64 (14)	93 (41)	48 (27)	46 (13)	30 (23)	60 (10)	20 (54)	25 (8)
<b>Community:</b>										
Dallas	100 (12)	93 (40)	100 (22)	90 (41)	71 (35)	74 (76)	25 (16)	45 (40)	19 (200)	32 (115)
<b>Median</b>	100	95	100	94	64	71	32	44	17	32

<sup>1</sup>Positive is defined as extremely, quite, or slightly sure will.<sup>2</sup>Immediate intention measured on a scale of extremely, quite, or slightly sure will; undecided; slightly, quite, or extremely sure I won't.**Table 4. Percent of risk group members reporting positive<sup>1</sup> 6-month intention<sup>2</sup> to use condoms consistently, by reported relative frequency of condom use**

Risk group and city	Relative frequency of condom use							
	%(N)							
	Almost every time		Sometimes		Almost never		Never	
	Partner type		Partner type		Partner type		Partner type	
	Main	Other	Main	Other	Main	Other	Main	Other
<b>Injecting drug users:</b>								
Denver	100 (7)	90 (19)	63 (16)	63 (30)	36 (11)	38 (26)	10 (73)	29 (58)
Long Beach	85 (13)	88 (34)	67 (18)	77 (35)	41 (17)	33 (18)	6 (154)	22 (85)
<b>Prostitutes:</b>								
Long Beach	100 (5)	91 (68)	46 (13)	80 (41)	50 (8)	33 (12)	9 (87)	35 (26)
Seattle	86 (7)	96 (45)	80 (10)	85 (13)	33 (6)	25 (4)	12 (49)	0 (2)
<b>Female sex partners:</b>								
Long Beach	100 (2)	...	33 (6)	...	0 (5)	...	10 (70)	...
New York	83 (12)	...	68 (25)	...	10 (31)	...	14 (154)	...
<b>Youth in high-risk situations:</b>								
Seattle	79 (14)	93 (41)	44 (27)	46 (13)	39 (23)	40 (10)	15 (54)	0 (8)
<b>Community:</b>								
Dallas	86 (22)	90 (41)	60 (35)	79 (76)	25 (16)	40 (40)	13 (200)	30 (115)
<b>Median</b>	86	91	62	78	35	36	11	26

<sup>1</sup>Positive is defined as extremely, quite, or slightly sure will.<sup>2</sup>Six-month intention measured on a scale of extremely, quite, or slightly sure will; undecided; slightly, quite, or extremely sure I won't.

*Duration of condom use.* Respondents who stated that they used condoms every time or almost every time were asked, "How long have you been using condoms every time (almost every time) with your main (or other) partner(s)?" Responses were categorized as less than 30 days, 1 month to 6 months, and more than 6 months.

*Future intention.* To assess future intentions, respondents who did not report that they used condoms every time were asked, "In the next 6 months, how likely do you think it is that you will start using a condom every time you have vaginal sex with your main (or other) partner(s)?" Responses were assessed on a seven-place likely-unlikely scale: Extremely likely I will, quite likely I will, slightly likely I will, uncertain, slightly likely I will not, quite likely I will not, extremely likely I will not.

*Immediate intention.* All respondents were asked, "How likely do you think it is that from now on you will use a condom every time you have vaginal sex with your main (or other) partner(s)?" Once again, responses were assessed on a seven-place likely-unlikely scale.

*Other behavioral measures.* To help determine the meaning of the behavioral response categories and investigate the internal consistency of behavioral responses, all respondents were asked, "The last time you had vaginal sex with your main (or other) partner(s), did you use a condom?" Those answering "yes" were then asked, "When was the last time you had vaginal sex with your main (or other) partner but did not use a condom?" Response categories for this latter question were the same as those used to assess duration.

*Demographic variables.* In addition to the information used to classify respondents with respect to SOC, the interviewers recorded the respondents' sex, age, and race or ethnicity.

## Results

A basic demographic summary of respondent characteristics by population is shown in table 1. Also shown is the proportion of respondents in each population that answered SOC questions for vaginal sex with main and other partners.

To ensure that the staging algorithm was broadly applicable across the ACDP, the data analyses were conducted by city within each population. Furthermore, as discussed previously, separate analyses were conducted for main and other partner relationships. Relatively few FSPs reported having

other than main sex partners in the previous 30 days and thus were not included in analyses of other partners. The presentation of results follows the stages of change in reverse order, starting with analyses pertinent to defining the maintenance stage and concluding with analyses used to define contemplators and precontemplators.

### Maintenance Stage

In the general SOC model, maintenance is defined by the length of time one performs a criterion behavior. For example, in the smoking domain, research has demonstrated that 6 months is the point at which relapse becomes significantly less likely, and thus con-

tinued abstinence from smoking for a period of 6 months is classified as the maintenance stage.

The length of time one must consistently use condoms to achieve maintenance of behavior change is unclear; longitudinal data are required to determine at what point, if any, relapse from consistent use begins to decline. With most health behaviors, maintenance has been defined as performing the behavioral criterion for at least 6 months (3). Using a relatively long time frame for condom use seems desirable to allow for a reasonable number of sexual encounters and range of circumstances in which condoms are used before one is classified as having achieved maintenance of consistent condom use. Thus, everytime use for at least 6 months was selected as the criterion for the maintenance stage.

*Defining consistent condom use.* Self-reported data are subject to a number of potential problems. For example, respondents' ability to recall past behavior, pressures to report the "correct" behavior, and differences in respondents' evaluation of what a given response implies (almost every time may mean 99 percent of the time to some respondents, and 70 percent of the time to others) may all affect self-reports. We therefore sought verification and explication of responses to the relative frequency item by examining the correspondence between those responses and the responses to the item asking about condom use at last intercourse.

Among those persons saying they use condoms every time, the percentage saying they used a condom during their last act of intercourse was consistently above 90 percent across populations, cities, and types of sexual act (table 2). Among those stating they use condoms almost every time, however, the percentage of those indicating condom use during the last sexual act fell to a median of around 70 percent. This suggests a meaningful difference between "everytime" and "almost everytime" use of condoms.

To evaluate the internal consistency of our measures, and

The success of such HIV prevention efforts relies on changing specific behaviors, and accurate assessment of behavior change is crucial to the evaluation of program effectiveness.

to assess the extent to which a relatively long (that is, 6-month) time frame produces problems in accuracy of recall or reliability (13), we considered respondents' answers to the question concerning the last time they did not use a condom. Among the subset of respondents who said they had used condoms every time for 6 months or more, the majority (overall, 82 percent for main partner and 73 percent for other partners) said that the last time they had not used a condom was at least 6 months ago. In contrast, the majority of respondents who reported using condoms almost every time for 6 months or more reported having intercourse without a condom within the past 30 days (overall, 56 percent for main partners and 54 percent for other partners).

To summarize, the above considerations led to a definition of maintenance that requires everytime use for at least 6 months.

## Action Stage

For a number of behaviors, the action stage (Action) has been defined as reaching the criterion behavior for some period of time less than 6 months (3). The minimum length of time required for practicing condom use to be classified in Action is unclear. To determine what the minimum duration should be, we examined the responses to the duration item, grouped into three categories: 6 months or more, more than 30 days but less than 6 months, and 30 days or less. Only a small percentage of respondents answered "30 days or less," and so, for the sake of simplicity, we categorized all everytime condom users for any length of time less than 6 months as being in Action.

Our criteria for Action closely follow the recent work of Prochaska. In our experience, however, people tend to think of Action rather literally. For example, using condoms more than 50 percent (but less than 100 percent) might seem very indicative of action. Later in this paper, we show how relaxing the behavioral criterion for Action to almost every time affects the distribution of respondents across the stages.

## Ready-for-Action Stage

The Ready-for-Action stage (Ready-for-Action) has been an elusive construct for other behaviors and has been variously described as preparation and decision making. In some applications the stage has not been used, primarily because of difficulties in measurement (3). The critical component of Ready-for-Action has been the intention to change the relevant behavior in the near future, perhaps within a week or month. An additional requirement of a significant behavioral attempt toward behavior change has been added to recent definitions of Ready-for-Action (3).

*Immediate intention.* Immediate intention was measured by response to the question, "... how likely do you think it is that from now on you will use a condom every time ...?" Following Prochaska (2), who uses dichotomous measures of intention, any affirmative response (extremely sure I will,

quite sure I will, slightly sure I will) was taken as an indication of an immediate intention to adopt (or continue) consistent condom use. However, a problem arose in that some respondents expressed a positive immediate intention (from now on) and a negative future intention (sometime in the next 6 months). In these cases, the respondent was not classified in Ready-for-Action. In effect, this solution is equivalent to adopting the procedure described by Prochaska, et al., of not asking the immediate intention item of persons with negative future intentions.

Responses to the immediate intention item generally followed level of current condom use (table 3). Across all groups and for both behaviors, more than 90 percent of respondents currently using condoms every time have a positive intention to continue their consistent use of condoms. Among "never users" of condoms, 18 percent (median percentage across populations) had positive immediate intentions to always use condoms with main partners, and 32 percent had positive immediate intentions to always use condoms with other partners.

Basing classification into Ready-for-Action only on the presence of a positive immediate intention to change would result in a single pool of people with condom use behavior ranging from almost every time to never. Although we cannot be certain, it seemed likely that current inconsistent condom users would be more likely to move ahead to the Action and Maintenance stages than "never" users with similar intentions. Furthermore, having some people who said they never use condoms classified in the third stage of five presented a measurement problem: all their subsequent change would have to be summarized on a very abbreviated scale. Thus, on grounds of measurement and presumed probability of improvement, and to be consistent with Prochaska's most recent theoretical position, we decided to include a behavioral criterion as a condition for classification into Ready-for-Action.

Ideally, behavioral criteria necessary for classification into Ready-for-Action would be the result of an empirical investigation. Such an investigation would identify behavioral steps which, after controlling for intentions, would be predictive of movement to the Action and Maintenance stages for condom use. In the absence of such a study, we sought a behavioral criterion for Ready-for-Action which would reflect a significant behavioral step toward consistent condom use. Responses of "almost never" or "never" seem to imply very little condom use (less than 10 percent, as seen in table 2); thus, we decided that a minimum response of "sometimes" to the relative frequency of use item should be required for classification into Ready-for-Action.

## Contemplation and Precontemplation Stages

*Future intention.* The difference between the Precontemplation and Contemplation stages has been based on the presence or absence of an intention to adopt the criterion behavior sometime in the future; those who have a positive

**Table 5. Distribution of risk group members across stages of change: consistent condom use for main and other partners**

Risk group and city	Stage of change									
	%(N)									
	Precontemplation		Contemplation		Ready-for-Action		Action		Maintenance	
	Partner type		Partner type		Partner type		Partner type		Partner type	
	Main	Other	Main	Other	Main	Other	Main	Other	Main	Other
Injecting drug users:										
Denver	71 ( 79)	51 ( 70)	11 (12)	21 (29)	14 (16)	25 (34)	1 ( 1)	1 ( 1)	3 ( 3)	2 ( 3)
Long Beach	79 (162)	47 ( 89)	9 (18)	14 (27)	11 (22)	30(56)	1 ( 1)	1 ( 1)	1 ( 2)	8(15)
Prostitutes:										
Long Beach	74 ( 90)	15 (37)	12 (15)	9 (22)	7 ( 8)	35 (88)	1 ( 1)	5 (12)	6 ( 7)	37(96)
Seattle	68 ( 50)	6 ( 7)	11 ( 8)	1 ( 1)	19 (14)	48 (56)	0 ( 0)	1 ( 1)	3 ( 2)	44(52)
Female sex partners:										
Long Beach	80 ( 72)	...	9 ( 8)	...	3 ( 3)	...	2 ( 2)	...	6 ( 5)	...
New York	63 (171)	...	10 (27)	...	9 (24)	...	4 (11)	...	14 (39)	...
Youth in high-risk situations:										
Seattle	53 ( 78)	24 ( 24)	14 (21)	6 ( 6)	13 (19)	41 (42)	5 ( 8)	2 ( 2)	5 ( 8)	28(28)
Community:										
Dallas	70 (200)	39 (121)	11 (31)	17 (54)	15 (42)	31 (97)	1 ( 4)	2 ( 6)	3 ( 8)	11(34)

future intention are eligible for Contemplation or later stages, and those who lack this intention are classified as Precontemplators (3). Future intention was measured by response to the question, "In the next 6 months, how likely do you think it is that you will start using a condom every time ...?" As with the immediate intention question, we considered responses of extremely likely, quite likely, or slightly likely to start using condoms all the time in the next 6 months as indicative of having a positive future intention.

We were also interested in the relationships between future intention and relative frequency of condom use. Data for each risk group are presented in table 4. Note that approximately two-thirds or more of "almost never" and "never" condom users have negative future intentions and are therefore classified as Precontemplative. In contrast, more than two-thirds of "sometimes" and "almost every time" users have positive future intentions and therefore are classified as either Contemplative or Ready-for-Action. These levels of condom use seemed consistent with what one might expect given the intentions indicated.

### Operational Definition of Stage of Change

Our final operational definitions of the stages are summarized in figure 1; four items were used for classification into the five stages. The same algorithm, with appropriately modified item wording, was used for vaginal sex with both main and other partners. The distribution of respondents across stages of change, as defined by the algorithm

described in this paper, is summarized in table 5.

Significant differences appear in the distributions of respondents as a function of city, behavior, and risk group. For example, with respect to condom use with one's main partner, FSPs in New York are further along the change process than are FSPs in Long Beach ( $\chi^2(4) = 15.2$ ,  $p < .005$ ). Similarly, with respect to condom use with clients, prostitutes in Seattle are further along in the change process than are prostitutes in Long Beach ( $\chi^2(4) = 34.2$ ,  $p < .001$ ).

Across all populations, there are more people in Precontemplation and fewer in Maintenance when it comes to condom use with one's main partner versus condom use with other partners. For example, IDUs having vaginal sex with both types of partners were further along in their use of condoms with other partners than with their main partners (McNemar's  $\chi^2(1) = 27.6$ ,  $p < .001$ ). Also of interest, YHRS are further along the SOC consistent condom use continuum than IDUs, with respect to both main ( $\chi^2(4) = 18.5$ ,  $p < .001$ ) and other ( $\chi^2(4) = 56.5$ ,  $p < .001$ ) partners. These findings provide face validity for the SOC algorithm.

### Sensitivity to Algorithm Particulars

Despite this face validity, it must be recalled that, in arriving at the algorithm particulars described above, a number of decisions were made. Each of these decisions can have an impact on the distribution of respondents in each of the five stages. Since there is a relatively large number of IDUs providing data about their condom use with other

**Table 6. Stage of change for using a condom consistently with other partners—injecting drug users**

Staging Algorithm	Stage of Change				
	Precontemplation	Contemplation	Ready-for-action	Action	Maintenance
One: final algorithm	48.9 (159)	17.2 (56)	27.7 (90)	0.6 (2)	5.5 (18)
Two: "almost every time" sufficient for Action	47.4 (154)	17.2 (56)	12.9 (42)	16.9 (55)	5.5 (18)
Three: no behavioral criterion for Ready-for-Action	48.9 (159)	3.1 (10)	41.8 (136)	0.6 (2)	5.5 (18)
Four: "quite sure" required for positive intentions	64.9 (211)	12.0 (39)	16.9 (55)	0.6 (5)	5.5 (18)

partners, these data will be used for illustration. The first row of table 6 shows the distribution of IDUs across stages of change as determined by our final algorithm.

The second row shows what happens if we define Action in a more literal sense. For example, it could be argued that people using condoms almost every time should be classified as being in the Action stage. Indeed, as discussed earlier, in our experience, many investigators have adopted this viewpoint. In the second row of table 6, we use an algorithm that differs from our final algorithm only in that persons reporting "almost every time" condom use (regardless of duration) are classified as being in the Action stage. The effect of this single change is that, in terms of relative percentage, the size of the Action group is comparable to both the Ready-for-Action and Contemplation groups. The additional people in Action are primarily persons who had been classified as Ready-for-Action (48 of 53), with a few who had been classified as Precontemplation (5 of 53).

The third row of table 6 shows the effects of requiring a meaningful behavioral attempt for classification into Ready-for-Action. The algorithm used in row three differs from our final algorithm in that there is no behavioral requirement for Ready-for-Action. More specifically, under the specifications of this algorithm, all respondents with positive future and immediate intentions (who are not in Action or Maintenance) are classified as being Ready-for-Action. Comparing the third row with the first, we see that many more people can be classified as Ready-for-Action.

Finally, in arriving at our final algorithm, responses of "extremely sure will," "quite sure will," or "slightly sure will" on each intention scale were considered a sufficient indication of having a positive intention. In the fourth row of table 6, the staging algorithm differs from the final algorithm in that only responses of "extremely sure will" or "quite sure will" are considered sufficient indications of positive intentions. The effect of this change is to reduce representation in Contemplation and Ready-for-Action by

30 to 40 percent, with a similar increase in the Precontemplation stage.

## Discussion

We developed an algorithm for defining the stages of change for adoption of consistent condom use based on three main criteria: the condom use practices necessary for the prevention of HIV infection, analogy with work on staging other health-related behaviors, and condom use data from high-risk groups of interest. These data, as well as disease prevention considerations, suggest everytime use as a criterion for the Action and Maintenance stages. Because of the everytime requirement for relative frequency of condom use and the limited

time frame (6 or fewer months), relatively few people were classified in Action. In contrast, there are relatively large numbers of participants at high risk in Ready-for-Action. This is noteworthy in that the Ready-for-Action stage has been the most difficult to specify in other empirical investigations. However, we believe that our definition of Ready-for-Action results in a meaningful classification of individuals; people in this stage display marked behavioral differences when compared with persons in Contemplation or Action.

Our criterion for differentiating persons in Precontemplation and Contemplation is the presence or absence of an intention to perform the criterion behavior sometime in the future. Those with negative future intentions are classified in Precontemplation while those with positive future intentions are classified in Contemplation. In addition, by requiring meaningful attempts at behavioral change for classification in Ready-for-Action, people with positive immediate intentions, but who have never or almost never used condoms are also classified in Contemplation. Thus there are two types of persons in Contemplation: those who intend to adopt consistent condom use sometime in the future but not immediately, and those who intend to use condoms consistently from now on, but who have not yet initiated change.

The analyses we have described use only measures of behavior and intention. Other measures are needed to further establish the validity of our algorithm, such as self-efficacy or decisional balance (the perceived advantages and disadvantages of a behavior change) (5, 14).

All behavioral data presented here are self-reported and thus subject to error due to inaccurate recall or concern about socially desirable responses. Several precautions were taken to minimize these sorts of errors. Time frames for recalling past behavior were kept as short as possible. To encourage accurate responses to sensitive questions, the survey began with the interviewer giving assurances of anonymity and asking for straightforward answers.



Respondents were periodically reminded that all answers were completely anonymous. The large number of respondents who report never using condoms and who report no intentions to use condoms in the future suggests that concern about social desirability of responses is not a major threat to these data.

Where possible, we have attempted to establish internal consistency by examining concordance of responses to sets of related items. Overall, the correspondence between reported frequency of use and last time use is striking, and provides some insight into what qualitative terms such as "sometimes" and "almost every time" mean to respondents. Although differences in the SOC distribution across behaviors and populations were noted, the relationship between variables (tables 2-4) was consistent across risk group and city, also suggesting that we have arrived at a broadly applicable measurement procedure for the pertinent behaviors.

Finally, and perhaps most important, the fact that changes in the algorithm can have profound effects on the way a given population is distributed among the five stages of change has important implications for using the SOC model as a basis for both the measurement of behavior change and for developing behavior change interventions. First, the progress toward positive behavior may, on the surface, appear different across studies because of differences in staging algorithms. Second, our results show that, no matter how they are defined, the stages do not describe homogeneous groups of people. Third, the stage of change model posits that "a person's stage of change provides prescriptive as well as prescriptive information on treatment of choice. Action-oriented therapies may be quite effective with individuals who are in the preparation or action stages. These same programs may be ineffective or detrimental, however, with individuals in precontemplation or contemplation stages." (3) The data presented in this paper make it clear that, depending upon the particular staging algorithm used, one could conclude that an action-oriented approach was appropriate or inappropriate for the same person.

Clearly, if the stage one is in varies significantly with the algorithm one uses, then, for any given algorithm, determining the type of intervention that will be most

Figure 1. Algorithm for assigning stage of change for consistent condom use<sup>1</sup>

Criterion	Stage of change				
	Precontemplation	Contemplation	Ready-for-action	Action	Maintenance
Relative frequency of use <sup>2</sup>	—	—	Sometimes or almost every time	Everytime	Every time
Duration of "every time" use <sup>1</sup>	—	—	—	Less than 6 months	6 months or longer
Immediate intention <sup>4</sup>	—	—	Extremely, quite, slightly sure will	—	—
Future intention <sup>5</sup>	—	Extremely, quite, slightly sure will	Extremely, quite, slightly sure will	—	—

<sup>1</sup>Algorithm applied by starting with criteria necessary for Maintenance, then Action, etc.

<sup>2</sup>"When you have vaginal sex with ..., how often do you use a condom? Every time, almost every time, sometimes, almost never, never."

<sup>3</sup>"How long have you been using a condom (every time, almost every time, you ...?"

<sup>4</sup>"...how likely do you think it is that from now on you will use a condom every time ...? Extremely, quite, slightly sure I will; undecided; slightly, quite, extremely sure I won't."

<sup>5</sup>"In the next 6 months, how likely do you think it is that you will start using condoms every time ...? Extremely, quite, slightly sure I will; undecided; slightly, quite, extremely sure I won't."

effective for moving people from one stage to another becomes an empirical question. Thus, while we are in general agreement with Prochaska's recommendation to match interventions (or treatment programs) with where an individual or group is in a change process, we believe it is an oversimplification to assume that a particular intervention focus (that is, specific change processes or cognitive factors) will be most appropriate for people in a given stage. Indeed, for the purposes of the ACDP, we assume that the intervention content most appropriate for respondents in a given stage will vary as a function of the behavior under consideration, the population being considered, and the particular staging algorithm one uses.

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