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Michael Cecil, *TheyFit Covington*

Anita L. Nelson, *David Geffen School of Medicine at UCLA*

James Trussell, *Princeton University*

[Robert Hatcher](#), *Emory University*

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## If the condom doesn't fit, you must resize it

Michael Cecil<sup>a,\*</sup>, Anita L. Nelson<sup>b</sup>, James Trussell<sup>c,d</sup>, and Robert Hatcher<sup>e</sup>

<sup>a</sup>TheyFit Covington, GA 30014, USA <sup>b</sup>David Geffen School of Medicine at UCLA, Torrance, CA 90502-2910, USA <sup>c</sup>Office of Population Research, Princeton University, Princeton, NJ 08540, USA <sup>d</sup>The Hull York Medical School, University of Hull, Hull HU6 7RX, England <sup>e</sup>Emory University School of Medicine, Atlanta, GA 30322, USA

When used properly, condoms provide excellent protection against sexually transmitted infections (STIs) and unintended pregnancies [1]. Non-use of condoms is the major risk factor for transmission of STIs, far overwhelming condom failure (slippage or breakage) or transmission of infectious agents through the latex barrier [2]. To increase acceptance and usage, condoms are manufactured and marketed in a variety of shapes, textures, colors and flavors. However, there are significant limitations imposed upon the sizes of condoms made available, and several recent studies highlight public health problems with current condom sizes and the need to expand the range of sizes [3–5].

Condoms are regulated medical devices and must conform to international standards such as ISO 4074: 2002 [6] and ASTM D 3492-08 [7] which directly or indirectly dictate the allowable sizes. Thus, most condoms are about 7 in. long (180-mm length), and 2 in. wide (52-mm lay flat width) [8]. In fact, both ISO 4074 and ASTM D 3492 mandate a minimal condom length of 160 mm, which is 1–2 in. longer than men's mean erect penile length as measured in multiple countries [9–12].

This homogeneity of condom sizes is a relatively recent development. Medical condoms were developed by Gabriello Fallopio in the 16th century to halt the spread of syphilis, the Great Pox, the first major STI [13]. Condoms were originally linen or animal gut, custom made and fitted to cover the penis of individual users. With the twentieth century developments of the latex condom dipping line and mass production, “one size fits all” condoms became normative.

But the range of men's penile dimensions markedly varies. In a study of 80 men, US urologists measured erect penile length and found it varied from 75 to 190 mm with penile circumference varying from 90 to 160 mm [9]. In a larger study of 820 men in which condom users measured their penile dimensions, researchers found that penile length varied from 40 to 260 mm with penile circumference varying from 30 to 190 mm [5].

Not surprisingly, a common complaint among condom users worldwide is about condom fit and feel. In 1993 urologists in the UK reported that condoms frequently do not fit and called

\*Corresponding author. Tel.: +1 678 964 2051 (office); fax: +1 770 786 8750. drmichael@drmichael.com (M. Cecil).

for more sizes to be made available [14]. In a 2003 clinical trial in France comparing a polyurethane condom to a latex condom, 39% of men reported their latex condom as too small or too large [15]. A survey of 1661 men from the 50 US states published in 2009 found that 17% described their condoms as being too long, 12% as being too short, 32% as too tight and 10% as too loose [4]. Researchers in Australia examined factors affecting men's liking of condoms and found three of the top five reasons for men not liking condoms to be related to the condom being too loose, too tight or too short [16].

Much more than a mere nuisance, inadequately sized condoms are known to cause adverse outcomes. Researchers' finding that Australian men with large penile circumferences have an increased rate of condom breakage [17] were subsequently confirmed by other researchers in another condom study done among US men [5]. Slippage may also result from overly large condoms.

In a recently published study, investigators surveyed 436 men to see if their condom fit satisfactorily and if there were problems associated with ill-fitting condoms [3]. Forty-five percent of the men reported that their condoms did not fit. Men who reported that their condoms did not fit properly had much higher rates of multiple problems including condom breakage and slippage, more difficulty for either partner to achieve orgasm, diminished pleasure for both partners, penile irritation, difficulty with or lost erection, early removal of condom, and condom drying out during sex. These authors conclude "...that men and their female sex partners may benefit from public health efforts designed to promote the improved fit of condoms."

Increasing the available range of condom sizes and widely distributing them is a straightforward process. The basic technology of dipping formers into latex vats for making large quantities of a single sized condom has already been modified to make dozens of condom sizes. To select a specific condom size, men measure their erect penile dimensions by downloading a measuring device that prints on a single sheet of paper. Researchers have tested men's ability to measure their erect penis correctly and found high correlation between the measurements reported by users compared to those obtained by health care professionals [10]. Condoms can be distributed at high traffic sites through automated kiosks that can dispense 100 different condoms [18].

The barrier to introduction of the needed variety of sizes rests with regulatory issues. The current version of ISO 4074 and ASTM D 3492 greatly limits the sizes of condoms made available — as noted previously, all condoms must be at least 160 mm despite the fact that the majority of men have shorter penises. In 2010, the ISO/TC 157 Committee is revising the ISO 4074 Standard for latex condoms and is considering proposals to include a wide range of condom sizes in the new standard. Medical regulators in Europe have approved an expanded range of condom sizes to be sold there. Testing parameters of condom release tests (the inflation tests and freedom of holes test) have been proposed for a wide range of sizes [19].

In summary, condoms are critical in preventing STIs and unintended pregnancies, and the significant non-use of condoms is a major obstacle that needs to be overcome. Men's penile

dimensions vary widely, and the size limitations of condoms currently made available impede condom use. A large clinical trial demonstrated that allowing consumers an expanded range of condom sizes from which to choose increased users' acceptance while maintaining equivalent slippage and breakage rates [5]. Clinical trials have affirmed and consumers have verified that they need and want a greater selection of condom sizes.

Having a wider range of condom sizes available would be a strong step forward for public health; therefore, international standard organizations and medical regulatory bodies should authorize and allow an expanded range of condom sizes.

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